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Evaluation of Rural Air Quality Simulation Models. Addendum A Muskingum River Data Base

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This addendum provides additional information regarding the performance of four rural air quality simulation models using SO_2 air quality and a modelers data base assembled for the Muskingum River Power Plant. The report contains numerous tabulations of each model's performance in terms of statistical measures recommended by the AMS. The four models evaluated included MPTER (EPA), PPSP (Martin Marietta Corp), MPSDM (ERT) and TEM-8A (Texas Air Control Board). Results from this evaluation were similar to those obtained for Clifty Creek, i.e., the models as a group tend to overpredict 1-hour averages, overpredict to a lesser extent 3-hour averages, and slightly underpredict 24-hour average concentrations.

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Evaluation of Rural Air Quality Simulation Models

Addendum A: Muskingum River Data Base

By

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PREFACE

This report summarizes performance statistics for several rural point source models. The performance of the models is based on data collected near the Muskingum River Power Plant. The report serves as an addendum to a previous publication* on model performance which was based on data from the Clifty Creek Power Plant. Other addenda to the Clifty Creek publication are also planned for additional data bases and for presentation of supplemental information on model performance.

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*Londergan, R. J., D. H. Minott, D. J. Wackter, T. Kincaid and D. Bonitata, 1982. Evaluation of Rural Air Quality Simulation Models. EPA Publication No. EPA-450/4-83-003. U.S. Environmental Protection Agency, Research Triangle Park, N.C. (NTIS No. PB 83-182758).

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SECTION 1

INTRODUCTION

In October of 1982, EPA published the results of a comprehensive evaluation of eight rural air quality simulation models using ambient SO_2, meteorological, and source data for the Clifty Creek Power Plant.[1] The evaluation was based on recommendations by the American Meteorological Society (AMS) regarding the use of statistical methods for comparing observed air quality with model predictions.[2] EPA later published an appendix[3] to the Clifty Creek report summarizing the performance of an additional model (PPSP) for the same data base and statistical procedures used in the original evaluation. The Clifty Creek report presents the first comprehensive evaluation of rural models using a standardized statistical protocol as recommended by the AMS.

The purpose of this addendum is to provide similar information on model performance based on data provided by Teknekron[4] for the Muskingum River Power Plant. The models evaluated are the following: (1) CRSTER/MPTER developed by EPA (2) MPSDM developed by ERT, Inc. (3) TEM-8A developed by the Texas Air Control Board and (4) PPSP developed by the Martin Marietta Corporation. The Muskingum River evaluation is confined to these four models since they essentially span the range of technology represented by the rural models as a group. The five models not applied here all use the Pasquill-Gifford dispersion curves as defined in the MPTER model, although their other features may differ somewhat from each other and from MPTER.

The principal technical features of the MPTER/CRSTER model and technical differences between it and other three models as run for this study are:

- MPTER/CRSTER (EPA)

  Full terrain subtraction
  Briggs final plume rise
  Uses stability classes A, B, C, D, E, F
  Stability class restriction (G replaced with F)
  Pasquill-Gifford σ_y and σ_z
  Mixing height (L) used for all stability classes
  Uniform mixing beyond where σ_z exceeds 1.6L
  Full plume penetration. When H >L, then ground-level concentration (x) = 0
  Wind profile power-law coefficients of 0.10, 0.15, 0.20, 0.25, 0.30 and 0.30 for stability classes A-F.

- MPSDM (ERT)

  ASME (1979) dispersion coefficients
  Terrain treatment (1/2 height, unstable and neutral; full terrain subtraction, stable)
  Transitional plume rise
  5 stability classes (F used for all stable)
  Stack-tip downwash
  Buoyancy enhanced dispersion (σ_y and σ_z)
  Mixing height not used for stable conditions
  Uniform mixing not assumed
  Briggs Partial plume penetration
  Wind profile power law coefficients (.09, .11, .12, .14, .20)

- TEM-8A (Texas Air Control Board)

  Flat terrain assumed
  Horizontal dispersion for 60-minute averages ($\sigma_y = C_i \ \sigma_y PG$;

  where C = 3.35, 2.70, 2.14, 1.71, 1.37, 1.37 for stabilities 1-6)

  Transitional plume rise
  Mixing height not used for stable conditions
  Uniform mixing at 2 times the distance beyond where $\sigma_z = 0.47L$
  Full plume penetration when H >2L; then x = 0.

- PPSP (Martin Marietta)

  Briggs dispersion coefficients
  Stability class selection based on (1) convective theory of scaling for daytime and (2) the Turner algorithm for nighttime
  Partial penetration of buoyant plume into the capping inversion
  Briggs plume rise formulas, including the "breakup" and "touchdown" models
  No terrain adjustments

It should be noted that EPA did not directly solicit input from the model developers prior to this evaluation, as was done for the Clifty Creek evaluation. This is due to the fact that the environmental and meteorological features around the Muskingum River plant are quite similar to those for Clifty Creek and the data bases are in an identical format on EPA's UNIVAC 1100 computer. For this reason, the options for each would be identical to those used in the Clifty Creek evaluation. The reader should refer to the Clifty Creek report for a more detailed description of the models, options used, and data archive procedures.

SECTION 2

AIR QUALITY DATA BASE AND STATISTICAL APPROACH

The Muskingum River Plant, located near Beverly, Ohio, is operated by the Ohio Power Company which is owned by the American Electric Power Corporation (AEP). It is a coal-fired, base load facility having two 252 meter stacks to vent emissions. Terrain around the plant is similar to that for Clifty Creek and consists of low ridges and rolling hills. The data base was assembled by Teknekron for 1975 and 1976 from air quality data measured by ERT, Inc., standard National Weather Service (NWS) data and plant operating data supplied by the AEP. The ambient monitoring network consisted of four SO_2 stations (1-4) ranging from about 4 to 20 kilometers from the plant (see Figure 1). The meteorological data, compiled by Teknekron in the standard format as output from the Meteorological Preprocessor Program,[5] were used as input to the models. The surface meteorological data was from the Parkersburg, West Virginia station while the upper air meteorological data was from Huntington, West Virginia. The Huntington station is located approximately 40 kilometers south of the plant while the Parkersburg station is situated approximately 140 kilometers to the southwest of the plant.

Unlike the Clifty Creek analysis, no appropriate on-site wind data was available for the Muskingum River site. The use of off-site meteorological data for the evaluation may have a minor, but unquantifiable, effect on the performance statistics. Pasquill-Gifford (P-G) stability classes were thus calculated by the meteorological preprocessor on the basis of insolation and wind speed using the Turner method. For each hour, the wind was

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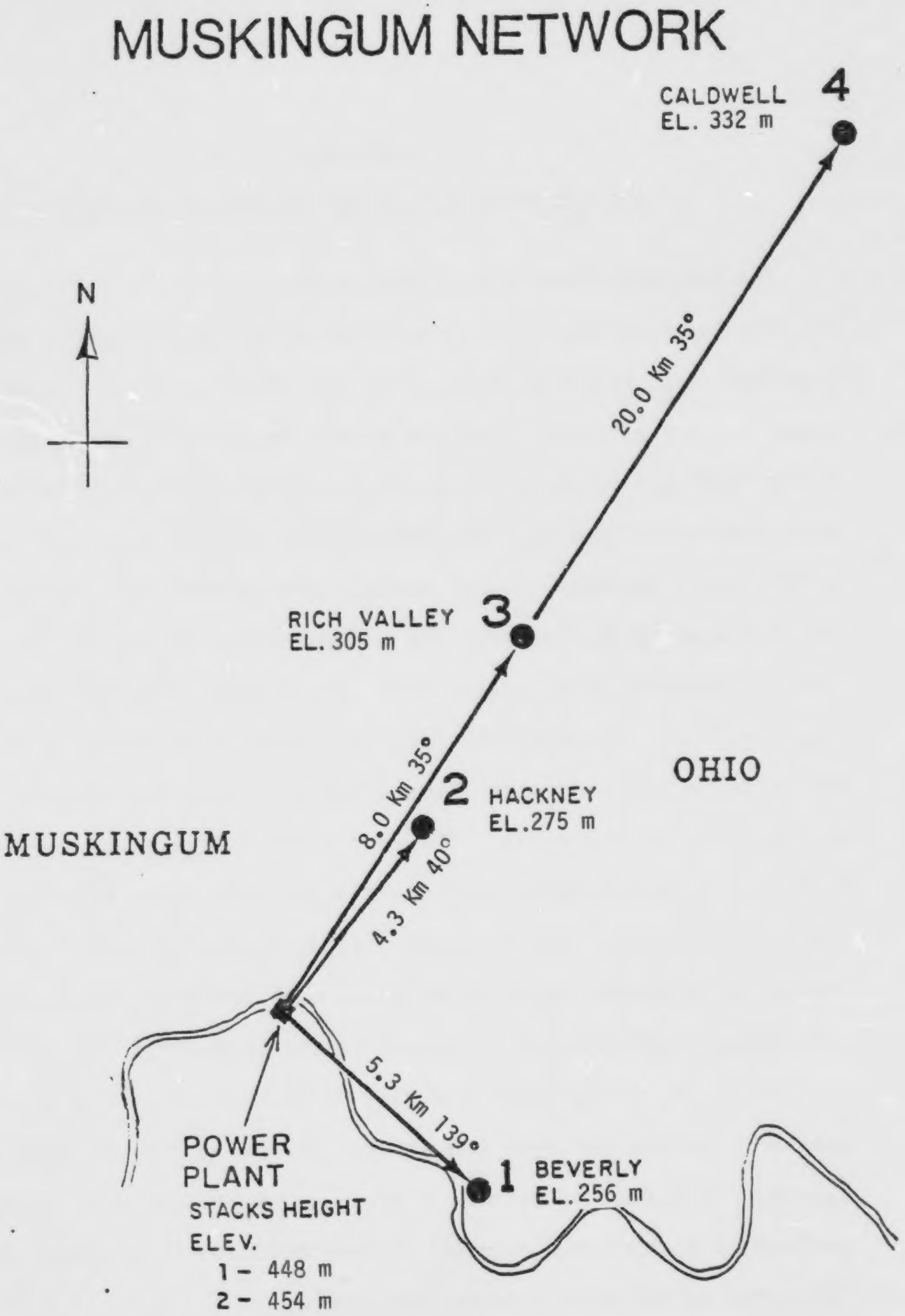
MUSKINGUM NETWORK
CALDWELL
EL. 332 m
4
N
20.0 Km 35°
RICH VALLEY
EL. 305 m
3
8.0 Km 35°
2
HACKNEY
EL.275 m
OHIO
MUSKINGUM
4.3 Km 40°
5.3 Km 139°
POWER
PLANT
STACKS HEIGHT
ELEV.
1 - 448 m
2 - 454 m
1
BEVERLY
EL.256 m

FIGURE 1

determined by taking the reported wind direction (specified to the nearest 10 degrees) and then using a radomization procedure to specify a value to the nearest degree. Input for calculating stability were hourly wind speed and cloud cover data from the Parkersburg NWS station. Hourly mixing heights were determined by the preprocessor based on morning radiosonde and surface temperature measurements at the Huntington NWS station, the hour of day, and hourly stability class.

As with Clifty Creek, source data includes hourly SO_2 emission rate, gas exit velocity and gas exit temperature. Values for the SO_2 emission rate were estimated for each hour based upon the percent load for each boiler and the average monthly sulfur content of the coal.

The performance statistics resulting from the evaluation are documented in Appendices A through D to this report. Upper and lower 95 percent confidence limits for the difference between the averages of the 25 highest observed and predicted values are enclosed in parenthesis. Although the formats of the tabular presentations are essentially the same as those contained in the Clifty Creek report, minor differences exist. These differences are explained in detail in Appendix G to the Clifty Creek report.

There is one other difference between the statistical procedures used in this analysis and those used in the Clifty Creek evaluation regarding selections of the 25 highest observed and predicted values. In an attempt to minimize the undesirable effects of spatial and temporal autocorrelation, the previous analysis excluded the lower of two values that were adjacent in time (two consecutive hours at the same station) or adjacent in space (two different stations for the same hour). Because the "statistical" improvements, if any, can not easily be demonstrated, such "adjacency" checking

was not performed in this analysis. Thus selection of the 25 highest values was done irrespective of whether or not they are adjacent in time or space.

The tables shown in the appendices to this report were generated with a software package that was specifically designed for model evaluation. The system, Model Evaluation Support System (MESS), was designed to aid in formatting and handling meteorological, air quality and source characteristic data. A statistical package incorporated into MESS calculates and outputs the AMS performance statistics in the prescribed format. Hourly background values were computed using the same approach described in the Clifty Creek report, i.e., a background concentration for each hour was calculated as the average of values at monitor locations outside the 90° sector downwind from the Muskingum River Plant.

SECTION 3

MODEL PERFORMANCE RESULTS

The performance statistics for the four rural models for 1975 and 1976 are presented in detail in the Appendices. Because the material is too voluminous to discuss easily, a series of summary tables analogous to those presented in the Clifty Creek report are shown. Table 1, which is derived from the information contained in Appendix A, compares the bias of each model for the 25 highest observed and predicted concentrations. Table 2, which was derived from Appendix B, compares the bias of each model using all concentration data. Table 3, which was derived from Appendix C and Appendix D, compares the ability of each model to predict the highest concentrations.

From Table 1 for the 25 highest values, it appears that the four models follow the same general trend observed for Clifty Creek. The models as a group, tend to overpredict 1-hour averages, overpredict to a lesser extent 3-hour averages, and slightly underpredict 24-hour average concentrations. PPSP is the exception to this general rule in that the 25 highest observed values are overpredicted for all three averaging periods for both 1975 and 1976. From the meteorological subsets, it appears that the models tend to overpredict for unstable conditions and for lower wind speeds and tend to underpredict for stable conditions and for higher wind speeds.

From Table 2 for the all-data category, the results for the four models again appear similar to those obtained for Clifty Creek. The models (except for PPSP) tend to underpredict for all three averaging periods for both 1975 and 1976. Trends in the results for different meteorological subsets are much less pronounced than for the 25 highest, but overprediction is again

indicated for unstable conditions despite the overall pattern of underprediction.

The results shown in Table 3 are for maximum observed and predicted concentrations for each year and averaging period. The first pair of concentrations, and their residuals, compare single highest observed and predicted values over all events and locations; the second pair of concentrations, and their residuals, compare the 4-station average of the maximum observed and predicted values occurring during each year. The single-valued residuals are reasonably consistent with results for the 25 highest concentration comparisons, considering that, the single-valued comparisons are "non-robust" and thus highly variable from a statistical point of view. Again, at one extreme, 1-hour averages tend to be overpredicted while, at the other extreme, 24-hour averages tend to be underpredicted. Results for comparison of the 4-station average maximum concentrations show similar patterns, i.e., 1-hour averages tend to be overpredicted while 24-hour averages tend to be slightly underpredicted.

TABLE 1A. DIFFERENCE OF OBSERVED AND PREDICTED AVERAGES OF THE 25 HIGHEST SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (US/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (US/M**3)			
		MPTER	MPSDM	PPSP	TEM-8A
1. ALL STATIONS/ALL EVENTS (A-4A)	624	-464 (-543, -384)	-341 (-404, -277)	-1352 (-1498, -1205)	-57 (-137, 23)
2. BY STATION/ALL EVENTS (A-4B)					
STATION 1	497	-265 (-355, -176)	-215 (-283, -146)	-876 (-1052, -699)	124 (57, 191)
STATION 2	441	-541 (-639, -443)	-428 (-516, -340)	-1399 (-1553, -1245)	-47 (-130, 36)
STATION 3	472	-417 (-490, -343)	-314 (-385, -244)	-720 (-827, -614)	-44 (-148, 61)
STATION 4	305	-87 (-152, -23)	-132 (-197, -67)	-233 (-317, -149)	73 (6, 140)
3. BY METEOROLOGICAL CONDITION (A-5)					
A. WIND SPEED					
< 2.5 M/SEC	515	-247 (-366, -128)	-330 (-426, -233)	-1165 (-1387, -944)	99 (29, 170)
2.5 TO 5.0	500	-530 (-612, -448)	-374 (-425, -322)	-1153 (-1264, -1053)	-150 (-239, -61)
> 5.0 M/SEC	449	-113 (-196, -30)	50 (-22, 123)	-509 (-625, -394)	225 (178, 272)
B. STABILITY GROUP					
CLASS A & B	475	-575 (-665, -484)	-402 (-457, -347)	-590 (-688, -492)	3 (-61, 67)
CLASS C	479	-418 (-479, -356)	-305 (-381, -230)	-1110 (-1280, -939)	-126 (-227, -24)
CLASS D	524	118 (65, 170)	-91 (-197, 15)	-1245 (-1404, -1086)	361 (300, 421)
CLASS E & F	137	-90 (-117, -63)	113 (104, 123)	-293 (-380, -206)	114 (105, 124)

TABLE 1B. DIFFERENCE OF OBSERVED AND PREDICTED AVERAGES OF THE 25 HIGHEST SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
		MPTER	MPSDM	PFSP	TEM-8A
1. ALL STATIONS/ALL EVENTS (A-4A)	913	-301 (-412, -190)	-395 (-568, -222)	-1480 (-1713, -1247)	248 (154, 342)
2. BY STATION/ALL EVENTS (A-4B)					
STATION 1	710	-110 (-251, 30)	-236 (-463, -9)	-801 (-1039, -563)	294 (203, 386)
STATION 2	727	-408 (-512, -304)	-290 (-389, -190)	-1423 (-1698, -1149)	239 (148, 330)
STATION 3	732	-59 (-131, 14)	-77 (-195, 41)	-630 (-791, -468)	293 (188, 398)
STATION 4	454	-62 (-127, 3)	-43 (-128, 41)	-239 (-332, -145)	185 (122, 248)
3. BY METEOROLOGICAL CONDITION (A-5)					
A. WIND SPEED					
< 2.5 M/SEC	380	-224 (-345, -103)	-758 (-967, -549)	-1344 (-1702, -986)	-5 (-73, 62)
2.5 TO 5.0	832	-346 (-469, -222)	-180 (-270, -90)	-1226 (-1377, -1075)	195 (89, 300)
> 5.0 M/SEC	802	3 (-76, 81)	165 (99, 231)	-119 (-196, -41)	504 (455, 553)
B. STABILITY GROUP					
CLASS A & B	654	-507 (-634, -380)	-348 (-433, -264)	-381 (-525, -237)	174 (102, 246)
CLASS C	796	-154 (-229, -79)	-193 (-366, -30)	-714 (-914, -515)	212 (97, 328)
CLASS D	782	303 (245, 360)	58 (-161, 278)	-1465 (-1735, -1194)	662 (601, 723)
CLASS E & F	308	73 (26, 120)	283 (246, 320)	-193 (-333, -54)	283 (246, 320)

TABLE 1C. DIFFERENCE OF OBSERVED AND PREDICTED AVERAGES OF THE 25 HIGHEST SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
		MPTER	MPSDM	PPSP	TEM-8A
1. ALL STATIONS/ALL EVENTS (A-4A)	395	-78 (-142, -13)	-48 (-106, 10)	-587 (-682, -492)	83 (33, 132)
2. BY STATION/ALL EVENTS (A-43)					
STATION 1	308	33 (-10, 76)	50 (8, 92)	-263 (-355, -170)	151 (111, 191)
STATION 2	241	-165 (-227, -103)	-136 (-194, -77)	-672 (-781, -563)	-14 (-66, 38)
STATION 3	257	-105 (-170, -40)	-73 (-138, -8)	-311 (-386, -236)	18 (-39, 75)
STATION 4	204	11 (-45, 66)	2 (-49, 54)	-71 (-126, -17)	75 (28, 123)
3. BY METEOROLOGICAL CONDITION (A-5)					
A. WIND SPEED					
< 2.5 M/SEC	276	44 (-20, 109)	-46 (-117, 26)	-295 (-380, -209)	98 (33, 162)
2.5 TO 5.0	307	-160 (-226, -94)	-93 (-151, -35)	-619 (-730, -508)	13 (-36, 62)
> 5.0 M/SEC	266	53 (13, 93)	102 (62, 142)	-210 (-295, -124)	153 (119, 187)
B. STABILITY GROUP					
CLASS A & B	246	-130 (-191, -70)	-78 (-131, -26)	-153 (-226, -80)	6 (-52, 64)
CLASS C	302	-119 (-190, -48)	-69 (-137, -1)	-485 (-619, -350)	31 (-24, 85)
CLASS D	302	102 (69, 136)	37 (-22, 97)	-499 (-571, -426)	192 (157, 227)
CLASS E & F	91	7 (-9, 23)	73 (63, 83)	-124 (-165, -83)	80 (70, 90)

TABLE 10. DIFFERENCE OF OBSERVED AND PREDICTED AVERAGES OF THE 25 HIGHEST SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
		MPTER	MPSDM	PPSP	TEM-8A
1. ALL STATIONS/ALL EVENTS (A-4A)	578	74 (13, 135)	51 (-52, 155)	-323 (-444, -201)	309 (263, 356)
2. BY STATION/ALL EVENTS (A-4B)					
STATION 1	377	63 (-11, 137)	1 (-124, 126)	-224 (-361, -88)	189 (134, 243)
STATION 2	453	-4 (-72, 64)	57 (-8, 122)	-369 (-458, -279)	235 (182, 288)
STATION 3	470	155 (103, 208)	153 (95, 211)	-61 (-124, 2)	264 (208, 319)
STATION 4	274	64 (28, 101)	89 (53, 124)	17 (-18, 51)	166 (137, 196)
3. BY METEOROLOGICAL CONDITION (A-5)					
A. WIND SPEED					
< 2.5 M/SEC	191	30 (-28, 88)	-140 (-270, -9)	-352 (-524, -179)	76 (29, 123)
2.5 TO 5.0	451	-20 (-85, 45)	26 (-30, 82)	-335 (-401, -269)	186 (137, 235)
> 5.0 M/SEC	522	185 (122, 248)	259 (204, 314)	16 (-44, 76)	375 (325, 425)
B. STABILITY GROUP					
CLASS A & B	316	-96 (-170, -21)	-51 (-125, 23)	-67 (-138, 3)	115 (55, 176)
CLASS C	408	66 (4, 128)	130 (79, 180)	-136 (-200, -71)	252 (207, 297)
CLASS D	450	205 (145, 265)	80 (-47, 207)	-411 (-544, -278)	313 (251, 376)
CLASS E & F	170	72 (42, 103)	142 (113, 171)	-47 (-96, 2)	161 (133, 189)

TABLE 1E. DIFFERENCE OF OBSERVED AND PREDICTED AVERAGES OF THE 25 HIGHEST SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
		MPTER	MPSDM	PPSP	TEM-8A
1. ALL STATIONS/ALL EVENTS (A-4A)	92	-3 (-19, 13)	3 (-12, 18)	-117 (-138, -96)	26 (13, 40)
2. BY STATION/ALL EVENTS (A-4B)					
STATION 1	67	25 (14, 37)	25 (13, 38)	-42 (-65, -20)	36 (25, 47)
STATION 2	50	-23 (-38, -8)	-15 (-28, -2)	-143 (-166, -120)	-1 (-10, 8)
STATION 3	59	-7 (-20, 7)	-2 (-16, 13)	-63 (-77, -49)	10 (-1, 21)
STATION 4	54	5 (-12, 22)	15 (-1, 32)	-1 (-18, 16)	27 (10, 43)

TABLE 1F. DIFFERENCE OF OBSERVED AND PREDICTED AVERAGES OF THE 25 HIGHEST SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
		MPTER	MPSDM	PPSP	TEM-8A
1. ALL STATIONS/ALL EVENTS (A-4A)	130	44 (29, 58)	46 (29, 62)	-53 (-75, -31)	75 (62, 89)
2. BY STATION/ALL EVENTS (A-4B)					
STATION 1	80	31 (15, 47)	24 (5, 42)	-26 (-49, -4)	43 (29, 57)
STATION 2	96	24 (9, 39)	34 (19, 50)	-75 (-96, -53)	55 (41, 69)
STATION 3	103	52 (37, 67)	51 (35, 66)	-6 (-23, 11)	64 (50, 78)
STATION 4	65	13 (4, 23)	31 (22, 41)	16 (6, 26)	46 (38, 55)

TABLE 2A. AVERAGE DIFFERENCE BETWEEN OBSERVED AND PREDICTED CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS (*)	AVERAGE OBSERVED VALUE(Co) (UG/M**3) (*)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
			MPTER	MPSDM	PPSP	TEM-8A
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2977	72.1	14.5(7.5, 21.5)	22.0(15.7, 28.3)	-71.7(-82.2, -61.1)	33.8(29.2, 38.5)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4061	66.3	8.1(2.5, 13.7)	12.5(7.3, 17.6)	-89.2(-97.1, -81.4)	21.1(17.4, 24.8)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	825	84.5	43.8(31.3, 56.3)	38.7(27.2, 50.2)	-58.1(-76.0, -40.2)	45.4(36.8, 54.1)
STATION 2	772	72.5	-15.7(-32.7, 1.2)	-15.7(-29.9, -1.4)	-213.6(-235.4,-191.8)	-0.7(-10.3, 8.9)
STATION 3	1279	62.1	8.3(-1.6, 18.1)	11.3(2.2, 20.5)	-72.8(-84.7, -60.9)	16.6(9.8, 23.3)
STATION 4	1185	54.0	-1.4(-8.7, 5.9)	14.5(7.4, 21.7)	-13.7(-21.4, -5.9)	23.9(18.7, 29.0)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	1082	60.7	30.7(21.5, 40.0)	10.3(0.3, 20.3)	-63.1(-80.2, -45.9)	29.9(23.3, 36.5)
2.5 TO 5.0	2215	63.9	-8.7(-17.0, -0.4)	0.8(-6.5, 8.0)	-110.1(-120.7, -99.4)	4.7(-0.5, 9.8)
> 5.0 M/SEC	764	81.1	24.7(13.5, 35.9)	51.3(41.9, 60.6)	-62.6(-76.7, -48.6)	61.1(53.3, 69.0)
B. STABILITY GROUP						
CLASS A & B	461	85.3	-82.1(-110.8, -53.4)	-72.4(-97.4, -47.5)	-101.2(-127.4, -74.9)	-53.2(-65.4, -41.1)
CLASS C	801	79.5	-52.2(-69.5, -34.8)	-38.9(-54.0, -23.7)	-153.5(-174.8,-132.1)	-27.2(-37.1, -17.2)
CLASS D	1953	66.4	42.8(38.1, 47.5)	40.5(35.4, 45.6)	-99.9(-110.8, -89.1)	63.2(59.3, 67.1)
CLASS E & F	846	43.1	34.3(30.9, 37.6)	43.9(42.2, 45.7)	25.5(19.8, 31.3)	44.2(42.5, 45.9)

(*) DUE TO THE EFFECTS OF IMPOSING A THRESHOLD CUTOFF VALUE, THE NUMBER OF EVENTS AND THE AVERAGE OBSERVED VALUE DIFFER SLIGHTLY FROM MODEL TO MODEL. THE VALUES LISTED ARE THOSE FOR MPTER.

TABLE 28. AVERAGE DIFFERENCE BETWEEN OBSERVED AND PREDICTED CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS (*)	AVERAGE OBSERVED VALUE(Co) (UG/M**3) (*)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
			MPTER	MPSDM	PPSP	TEM-8A
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2929	107.8	38.6(29.9, 47.3)	48.8(40.3, 57.2)	-53.4(-65.2, -41.6)	65.6(59.3, 71.9)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4598	97.6	37.2(31.1, 43.4)	44.3(38.3, 50.3)	-57.0(-65.2, -48.9)	55.5(51.0, 60.1)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	625	121.0	64.1(44.8, 83.3)	46.9(26.0, 67.8)	-72.5(-96.5, -48.4)	63.8(49.7, 77.9)
STATION 2	981	126.3	45.3(27.8, 62.8)	51.5(35.9, 67.0)	-142.0(-163.1,-120.9)	61.9(50.5, 73.2)
STATION 3	1571	98.3	48.6(38.8, 58.3)	52.1(42.2, 61.9)	-33.1(-45.5, -20.7)	60.0(51.9, 68.1)
STATION 4	1421	66.7	7.4(0.0, 14.8)	28.9(22.2, 35.5)	4.9(-2.7, 12.5)	41.7(36.7, 46.7)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	861	68.7	46.8(37.8, 55.8)	8.7(-6.1, 23.5)	-39.9(-61.4, -18.4)	43.6(36.8, 50.3)
2.5 TO 5.0	2304	92.8	23.6(14.2, 33.0)	35.2(26.6, 43.7)	-81.1(-93.1, -69.1)	35.6(29.0, 42.1)
> 5.0 M/SEC	1433	122.7	53.4(42.3, 64.5)	83.3(73.2, 93.3)	-25.9(-37.3, -14.5)	100.1(91.1, 109.1)
B. STABILITY GROUP						
CLASS A & B	434	116.3	-57.3(-91.4, -23.2)	-56.6(-87.2, -25.9)	-74.8(-104.1, -45.5)	-35.8(-52.0, -19.5)
CLASS C	945	133.2	9.6(-8.7, 28.0)	20.6(2.9, 38.3)	-64.2(-83.8, -44.7)	25.6(13.6, 37.6)
CLASS D	2177	95.7	59.8(53.3, 66.2)	66.8(59.9, 73.6)	-88.8(-100.9, -76.7)	95.8(90.2, 101.5)
CLASS E & F	1042	61.6	54.6(50.6, 58.7)	62.5(59.2, 65.9)	43.6(37.1, 50.0)	62.7(59.4, 66.1)

(*) DUE TO THE EFFECTS OF IMPOSING A THRESHOLD CUTOFF VALUE, THE NUMBER OF EVENTS AND THE AVERAGE OBSERVED VALUE DIFFER SLIGHTLY FROM MODEL TO MODEL. THE VALUES LISTED ARE THOSE FOR MPTER.

TABLE 2C. AVERAGE DIFFERENCE BETWEEN OBSERVED AND PREDICTED CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS (*)	AVERAGE OBSERVED VALUE(Co) (UG/M**3) (*)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
			MPTER	MPSDM	PPSP	TEM-8A
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1026	62.4	10.6(2.9, 18.3)	18.4(11.2, 25.6)	-67.5(-78.9, -56.1)	30.5(24.6, 36.4)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1489	55.1	4.5(-1.4, 10.4)	8.8(3.1, 14.5)	-75.0(-82.7, -67.3)	16.9(12.5, 21.4)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	292	74.1	36.4(22.5, 50.2)	32.1(19.4, 44.9)	-50.0(-67.2, -32.8)	37.9(27.3, 48.4)
STATION 2	298	57.9	-16.7(-33.1, -0.2)	-15.7(-29.9, -1.6)	-159.6(-178.8,-140.4)	-2.7(-13.3, 7.8)
STATION 3	455	53.9	5.4(-5.4, 16.1)	8.8(-1.5, 19.2)	-62.2(-74.1, -50.3)	13.3(5.3, 21.2)
STATION 4	444	41.9	-3.2(-10.7, 4.4)	10.7(2.5, 19.0)	-15.3(-23.5, -7.1)	21.4(14.5, 28.3)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	347	54.7	28.6(18.0, 39.2)	8.3(-3.5, 20.2)	-46.4(-61.7, -31.1)	26.0(16.8, 35.2)
2.5 TO 5.0	888	51.2	-9.5(-17.5, -1.4)	-0.4(-7.8, 6.9)	-90.8(-101.2, -80.5)	4.8(-0.9, 10.4)
> 5.0 M/SEC	254	69.6	20.4(7.5, 33.4)	44.9(32.1, 57.7)	-56.8(-73.0, -40.5)	52.1(40.5, 63.7)
B. STABILITY GROUP						
CLASS A & B	166	65.1	-53.6(-79.3, -27.9)	-45.8(-68.2, -23.4)	-67.0(-91.3, -42.7)	-34.7(-49.1, -20.2)
CLASS C	376	62.2	-32.5(-47.4, -17.6)	-22.3(-36.1, -8.4)	-102.5(-121.5, -83.6)	-11.8(-21.5, -2.1)
CLASS D	703	54.6	29.1(23.3, 34.9)	28.1(21.7, 34.6)	-85.2(-95.4, -75.0)	46.8(41.4, 52.1)
CLASS E & F	244	39.1	30.2(25.6, 34.7)	40.8(37.8, 43.8)	9.3(0.6, 18.1)	41.8(38.9, 44.7)

(*) DUE TO THE EFFECTS OF IMPOSING A THRESHOLD CUTOFF VALUE, THE NUMBER OF EVENTS AND THE AVERAGE OBSERVED VALUE DIFFER SLIGHTLY FROM MODEL TO MODEL. THE VALUES LISTED ARE THOSE FOR MPTER.

TABLE 2D. AVERAGE DIFFERENCE BETWEEN OBSERVED AND PREDICTED CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS (*)	AVERAGE OBSERVED VALUE(Co) (UG/M**3) (*)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
			MPTER	MPSDM	PPSP	TEM-8A
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1113	86.5	28.9(19.8, 37.9)	38.6(29.4, 47.8)	-47.4(-58.8, -35.9)	55.2(47.7, 62.7)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1852	77.8	29.0(22.8, 35.2)	36.4(30.0, 42.7)	-45.0(-52.4, -37.7)	46.1(40.9, 51.3)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	251	95.0	48.1(28.7, 67.5)	34.1(12.4, 55.8)	-54.7(-75.5, -33.9)	49.0(33.8, 64.3)
STATION 2	405	99.0	33.9(16.9, 50.9)	39.1(24.0, 54.3)	-105.7(-123.1, -88.3)	48.1(35.9, 60.3)
STATION 3	609	81.9	40.9(30.5, 51.3)	46.5(35.6, 57.4)	-27.0(-38.4, -15.5)	50.8(41.3, 60.3)
STATION 4	587	51.6	5.1(-1.9, 12.1)	24.2(17.4, 31.1)	4.9(-2.4, 12.3)	37.3(31.2, 43.4)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	297	56.1	41.8(33.0, 50.5)	20.5(5.7, 35.2)	-21.7(-40.0, -3.4)	40.0(32.8, 47.3)
2.5 TO 5.0	981	73.8	18.5(9.8, 27.2)	24.2(15.7, 32.6)	-61.6(-71.6, -51.6)	29.8(23.0, 36.6)
> 5.0 M/SEC	574	95.9	40.3(28.2, 52.5)	68.6(56.5, 80.7)	-26.4(-39.3, -13.4)	82.9(71.3, 94.5)
B. STABILITY GROUP						
CLASS A & B	179	77.6	-35.3(-62.8, -7.8)	-30.7(-56.2, -5.2)	-51.3(-75.0, -27.5)	-19.5(-35.6, -3.3)
CLASS C	408	109.7	19.0(1.4, 36.7)	29.0(12.6, 45.3)	-47.1(-64.8, -29.3)	32.5(19.6, 45.5)
CLASS D	886	74.3	40.2(33.0, 47.3)	47.3(39.0, 55.7)	-67.6(-78.3, -56.9)	69.7(62.7, 76.7)
CLASS E & F	379	51.7	43.9(39.0, 48.9)	53.3(48.9, 57.7)	24.6(17.6, 31.5)	55.1(50.7, 59.4)

(*) DUE TO THE EFFECTS OF IMPOSING A THRESHOLD CUTOFF VALUE, THE NUMBER OF EVENTS AND THE AVERAGE OBSERVED VALUE DIFFER SLIGHTLY FROM MODEL TO MODEL. THE VALUES LISTED ARE THOSE FOR MPTER.

TABLE 2E. AVERAGE DIFFERENCE BETWEEN OBSERVED AND PREDICTED CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS (*)	AVERAGE OBSERVED VALUE(Co) (UG/M**3) (*)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
			MPTER	MPSDM	PPSP	TEM-8A
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	350	26.1	8.3(4.6, 12.0)	11.0(7.6, 14.5)	-24.1(-30.5, -17.7)	14.3(11.3, 17.4)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	812	17.9	5.7(3.7, 7.7)	6.6(4.8, 8.5)	-16.9(-20.0, -13.8)	8.6(6.9, 10.2)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	156	21.2	12.3(7.7, 16.8)	11.2(6.7, 15.7)	-11.7(-18.4, -5.0)	12.6(8.6, 16.6)
STATION 2	171	17.2	0.6(-4.3, 5.6)	0.5(-3.8, 4.8)	-43.3(-51.3, -35.4)	3.2(-0.4, 6.8)
STATION 3	245	19.0	7.4(3.9, 10.9)	7.9(4.6, 11.3)	-12.7(-17.6, -7.8)	9.3(6.4, 12.3)
STATION 4	240	15.0	3.2(0.0, 6.4)	6.8(3.7, 9.9)	0.4(-2.9, 3.7)	9.0(6.2, 11.9)

(*) DUE TO THE EFFECTS OF IMPOSING A THRESHOLD CUTOFF VALUE, THE NUMBER OF EVENTS AND THE AVERAGE OBSERVED VALUE DIFFER SLIGHTLY FROM MODEL TO MODEL. THE VALUES LISTED ARE THOSE FOR MPTER.

TABLE 2F. AVERAGE DIFFERENCE BETWEEN OBSERVED AND PREDICTED CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS (*)	AVERAGE OBSERVED VALUE(Co) (UG/M**3) (*)	DIFFERENCE OF AVERAGES (Co - Cp) FOR EACH MODEL (UG/M**3)			
			MPTER	MPSDM	PPSP	TEM-8A
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	336	35.0	13.7(9.1, 18.3)	16.5(12.0, 21.1)	-18.5(-24.9, -12.1)	22.3(18.2, 26.4)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	795	25.9	11.5(9.0, 13.9)	13.1(10.7, 15.5)	-12.3(-15.6, -9.0)	16.1(13.9, 18.3)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	131	25.3	14.0(7.6, 20.5)	10.6(3.9, 17.3)	-13.5(-21.0, -6.1)	14.3(8.7, 20.0)
STATION 2	178	31.1	12.5(6.3, 18.7)	14.1(8.4, 19.9)	-36.9(-45.2, -28.6)	16.8(11.7, 22.0)
STATION 3	246	29.3	16.0(11.5, 20.5)	16.9(12.4, 21.4)	-6.4(-11.9, -0.8)	19.2(14.9, 23.4)
STATION 4	240	19.1	4.6(1.3, 8.0)	9.9(6.9, 12.8)	4.4(1.2, 7.6)	13.3(10.6, 16.0)

(*) DUE TO THE EFFECTS OF IMPOSING A THRESHOLD CUTOFF VALUE, THE NUMBER OF EVENTS AND THE AVERAGE OBSERVED VALUE DIFFER SLIGHTLY FROM MODEL TO MODEL. THE VALUES LISTED ARE THOSE FOR MPTER.

TABLE 3A. COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES

MUSKINGUM (1975) AVERAGING TIME: 1 HOUR

MODEL	HIGHEST OBSERVED VALUE OVER ALL EVENTS AND LOCATIONS CoMAX (UG/M**3)	HIGHEST PREDICTED VALUE OVER ALL EVENTS AND LOCATIONS CpMAX (UG/M**3)	DIFFERENCE OF MAXIMUM VALUES Co - Cp (UG/M**3)	AVERAGE OF MAXIMUM VALUES OBSERVED AT EACH STATION Co (UG/M**3)	AVERAGE OF MAXIMUM VALUES PREDICTED AT EACH STATION Cp (UG/M**3)	AVERAGE DIFFERENCE Co - Cp (UG/M**3)
MPTER	804.0	1783.0	-979.0	740.9	1182.8	-441.8
MPSDM	804.0	1452.0	-648.0	740.9	1038.8	-297.8
PPSP	804.0	3033.0	-2229.0	740.9	2200.0	-1459.1
TEM-8A	804.0	1019.0	-215.0	740.9	829.8	-88.8

TABLE 3B. COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES

MUSKINGUM (1976) AVERAGING TIME: 1 HOUR

MODEL	HIGHEST OBSERVED VALUE OVER ALL EVENTS AND LOCATIONS CoMAX (UG/M**3)	HIGHEST PREDICTED VALUE OVER ALL EVENTS AND LOCATIONS CpMAX (UG/M**3)	DIFFERENCE OF MAXIMUM VALUES Co - Cp (UG/M**3)	AVERAGE OF MAXIMUM VALUES OBSERVED AT EACH STATION Co (UG/M**3)	AVERAGE OF MAXIMUM VALUES PREDICTED AT EACH STATION Cp (UG/M**3)	AVERAGE DIFFERENCE Co - Cp (UG/M**3)
MPTER	1191.3	1963.0	-771.8	1050.8	1503.0	-452.2
MPSDM	1191.3	2362.0	-1170.8	1050.8	1713.3	-662.4
PPSP	1191.3	4068.0	-2876.8	1050.8	2760.3	-1709.4
TEM-8A	1191.3	1136.0	55.3	1050.8	890.8	160.1

TABLE 3C. COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES

MUSKINGUM (1975) AVERAGING TIME: 3 HOURS

MODEL	HIGHEST OBSERVED VALUE OVER ALL EVENTS AND LOCATIONS CoMAX (UG/M**3)	HIGHEST PREDICTED VALUE OVER ALL EVENTS AND LOCATIONS CpMAX (UG/M**3)	DIFFERENCE OF MAXIMUM VALUES Co - Cp (UG/M**3)	AVERAGE OF MAXIMUM VALUES OBSERVED AT EACH STATION Co (UG/M**3)	AVERAGE OF MAXIMUM VALUES PREDICTED AT EACH STATION Cp (UG/M**3)	AVERAGE DIFFERENCE Co - Cp (UG/M**3)
MPTER	606.3	963.3	-357.0	531.8	668.5	-136.7
MPSDM	606.3	876.3	-270.0	531.8	626.3	-94.5
PPSP	606.3	1536.3	-930.0	531.8	1047.1	-515.2
TEM-8A	606.3	534.7	71.7	531.8	408.4	123.4

TABLE 3D. COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES

MUSKINGUM (1976) AVERAGING TIME: 3 HOURS

MODEL	HIGHEST OBSERVED VALUE OVER ALL EVENTS AND LOCATIONS CoMAX (UG/M**3)	HIGHEST PREDICTED VALUE OVER ALL EVENTS AND LOCATIONS CpMAX (UG/M**3)	DIFFERENCE OF MAXIMUM VALUES Co - Cp (UG/M**3)	AVERAGE OF MAXIMUM VALUES OBSERVED AT EACH STATION Co (UG/M**3)	AVERAGE OF MAXIMUM VALUES PREDICTED AT EACH STATION Cp (UG/M**3)	AVERAGE DIFFERENCE Co - Cp (UG/M**3)
MPTER	852.0	878.3	-26.3	687.8	604.2	83.6
MPSDM	852.0	1508.3	-656.3	687.8	807.0	-119.2
PPSP	852.0	1981.7	-1129.7	687.8	1140.9	-453.1
TEM-8A	852.0	411.3	440.7	687.8	316.2	371.6

TABLE 3E. COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES

MUSKINGUM (1975) AVERAGING TIME: 24 HOURS

MODEL	HIGHEST OBSERVED VALUE OVER ALL EVENTS AND LOCATIONS CoMAX (UG/M**3)	HIGHEST PREDICTED VALUE OVER ALL EVENTS AND LOCATIONS CpMAX (UG/M**3)	DIFFERENCE OF MAXIMUM VALUES Co - Cp (UG/M**3)	AVERAGE OF MAXIMUM VALUES OBSERVED AT EACH STATION Co (UG/M**3)	AVERAGE OF MAXIMUM VALUES PREDICTED AT EACH STATION Cp (UG/M**3)	AVERAGE DIFFERENCE Co - Cp (UG/M**3)
MPTER	206.0	165.8	40.1	129.1	125.2	3.9
MPSDM	206.0	150.0	56.0	129.1	111.4	17.7
PPSP	206.0	298.1	-92.2	129.1	208.2	-79.1
TEM-8A	206.0	103.5	102.4	129.1	77.1	52.0

TABLE 3F. COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES

MUSKINGUM (1976) AVERAGING TIME: 24 HOURS

MODEL	HIGHEST OBSERVED VALUE OVER ALL EVENTS AND LOCATIONS CoMAX (UG/M**3)	HIGHEST PREDICTED VALUE OVER ALL EVENTS AND LOCATIONS CpMAX (UG/M**3)	DIFFERENCE OF MAXIMUM VALUES Co - Cp (UG/M**3)	AVERAGE OF MAXIMUM VALUES OBSERVED AT EACH STATION Co (UG/M**3)	AVERAGE OF MAXIMUM VALUES PREDICTED AT EACH STATION Cp (UG/M**3)	AVERAGE DIFFERENCE Co - Cp (UG/M**3)
MPTER	218.0	137.5	80.6	171.7	113.2	58.4
MPSDM	218.0	190.7	27.4	171.7	118.7	53.0
PPSP	218.0	299.3	-81.3	171.7	214.9	-43.2
TEM-8A	218.0	72.7	145.3	171.7	61.0	110.6

SECTION 4

CONCLUSIONS

The evaluation of 4 rural models using data collected around the Muskingum River Power Plant revealed levels and patterns of model performance that are quite similar to those observed for the Clifty Creek plant. Generally, highest 1-hour concentrations were overpredicted by all four models, while highest 24-hour concentrations were slightly underpredicted. Greatest overpredictions occurred during unstable conditions and for lower wind speeds, while greatest underpredictions occurred during the more stable hours and for the higher wind speeds.

Although no formal tests of significance were used to distinquish levels of performance among the four models, it appeared that PPSP consistently overpredicted concentrations relative to the other models, while TEM-8A tended towards underprediction. The performance of MPSDM and MPTER, varied among the averaging periods and meteorological subsets, but tended on average to be relatively unbiased compared to the other two models.

A clear need exists to continue the evaluation process to include additional data bases and varying meteorological and environmental settings. Supplementing of these evaluations with additional analysis and data bases will help provide a firm technical basis for establishing levels of uncertainty in air quality models and strengthening confidence in estimates used for regulatory purposes.

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APPENDIX A

Statistics for 25 Highest Values

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	624	1088	-464 (-543, -384)	-448 (-483, -393)	0.26 (0.11, 0.59)	1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	497	762	-265 (-355, -176)	-251 (-330, -144)	0.24 (0.10, 0.54)	0.72(0.385)
STATION 2	441	982	-541 (-639, -443)	-509 (-569, -430)	0.17 (0.07, 0.38)	1.00(0.385)
STATION 3	472	889	-417 (-490, -343)	-506 (-536, -348)	1.26 (0.56, 2.86)	0.92(0.385)
STATION 4	385	472	-87 (-152, -23)	-124 (-159, -53)	4.62 (2.04,10.49)	0.68(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	515	762	-247 (-366, -128)	-176 (-354, -86)	0.28 (0.12, 0.63)	0.48(0.385)
2.5 TO 5.0	500	1030	-530 (-612, -448)	-515 (-558, -467)	0.28 (0.12, 0.63)	1.00(0.385)
> 5.0 M/SEC	449	562	-113 (-196, -30)	-95 (-163, -18)	0.37 (0.16, 0.84)	0.32(0.385)
B. STABILITY GROUP						
CLASS A & B	475	1050	-575 (-665, -484)	-567 (-607, -487)	0.27 (0.12, 0.61)	1.00(0.385)
CLASS C	479	897	-418 (-479, -356)	-477 (-488, -370)	1.15 (0.51, 2.61)	0.96(0.385)
CLASS D	524	406	118 (65, 170)	101 (51, 158)	4.32 (1.90, 9.81)	-0.56(0.385)
CLASS E & F	137	227	-90 (-117, -63)	-76 (-103, -50)	0.12 (0.05, 0.27)	0.84(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	913	1214	-301 (-412, -190)	-255 (-326, -173)	0.14 (0.06, 0.31)	0.92(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	710	820	-110 (-251, 30)	-94 (-188, 29)	0.38 (0.17, 0.86)	0.28(0.385)
STATION 2	727	1134	-408 (-512, -304)	-391 (-461, -295)	0.30 (0.13, 0.68)	0.88(0.385)
STATION 3	782	841	-59 (-131, 14)	-42 (-122, 12)	1.02 (0.45, 2.32)	0.32(0.385)
STATION 4	454	516	-62 (-127, 3)	-40 (-104, -17)	1.08 (0.48, 2.45)	0.48(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	380	604	-224 (-345, -103)	-196 (-297, -60)	0.19 (0.09, 0.44)	0.44(0.385)
2.5 TO 5.0	832	1178	-346 (-469, -222)	-252 (-369, -204)	0.22 (0.10, 0.49)	0.80(0.385)
> 5.0 M/SEC	802	800	3 (-76, 81)	18 (-57, 79)	0.52 (0.23, 1.19)	-0.16(0.385)
B. STABILITY GROUP						
CLASS A & B	654	1161	-507 (-634, -380)	-442 (-551, -358)	0.19 (0.08, 0.44)	0.88(0.385)
CLASS C	796	950	-154 (-229, -79)	-129 (-226, -74)	1.51 (0.67, 3.43)	0.56(0.385)
CLASS D	782	479	303 (245, 360)	287 (222, 342)	8.81 (3.88,20.00)	-1.00(0.385)
CLASS E & F	308	236	73 (26, 120)	53 (16, 107)	1.38 (0.61, 3.12)	-0.48(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	395	473	-78 (-142, -13)	-63 (-99, -15)	0.26 (0.12, 0.60)	0.36(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	308	275	33 (-10, 76)	52 (-20, 79)	2.62 (1.16, 5.95)	-0.32(0.385)
STATION 2	241	406	-165 (-227, -103)	-135 (-207, -107)	0.68 (0.30, 1.53)	0.64(0.385)
STATION 3	257	362	-105 (-170, -40)	-90 (-133, -64)	0.48 (0.21, 1.10)	0.72(0.385)
STATION 4	204	193	11 (-45, 66)	-7 (-27, 11)	1.39 (0.61, 3.15)	0.44(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	276	231	44 (-20, 109)	-2 (-29, 101)	2.81 (1.24, 6.39)	-0.28(0.385)
2.5 TO 5.0	307	467	-160 (-226, -94)	-124 (-177, -87)	0.26 (0.11, 0.58)	0.84(0.385)
> 5.0 M/SEC	266	213	53 (13, 93)	54 (18, 86)	1.38 (0.61, 3.13)	-0.36(0.385)
B. STABILITY GROUP						
CLASS A & B	246	377	-130 (-191, -70)	-136 (-180, -93)	1.23 (0.54, 2.80)	0.68(0.385)
CLASS C	302	421	-119 (-190, -48)	-81 (-146, -54)	0.53 (0.23, 1.20)	0.64(0.385)
CLASS D	302	200	102 (69, 136)	101 (64, 130)	2.77 (1.22, 6.30)	-0.64(0.385)
CLASS E & F	91	84	7 (-9, 23)	16 (-3, 25)	0.26 (0.12, 0.59)	-0.48(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	578	504	74 (13, 135)	107 (28, 130)	0.77 (0.34, 1.75)	-0.52(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	377	314	63 (-11, 137)	52 (11, 121)	0.83 (0.37, 1.89)	-0.40(0.385)
STATION 2	453	457	-4 (-72, 64)	16 (-59, 51)	0.89 (0.39, 2.02)	0.16(0.385)
STATION 3	470	315	155 (103, 208)	144 (87, 193)	7.14 (3.15,16.21)	-0.76(0.385)
STATION 4	274	210	64 (28, 101)	69 (35, 93)	1.12 (0.49, 2.53)	-0.60(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	191	161	30 (-28, 88)	28 (-4, 63)	1.25 (0.55, 2.83)	-0.44(0.385)
2.5 TO 5.0	451	471	-20 (-85, 45)	-9 (-63, 35)	0.71 (0.31, 1.62)	0.16(0.385)
> 5.0 M/SEC	522	337	185 (122, 248)	172 (130, 234)	1.18 (0.52, 2.67)	-0.76(0.385)
B. STABILITY GROUP						
CLASS A & B	316	411	-96 (-170, -21)	-108 (-155, -53)	1.50 (0.66, 3.40)	0.52(0.385)
CLASS C	488	422	66 (4, 128)	89 (34, 131)	0.54 (0.24, 1.23)	-0.48(0.385)
CLASS D	450	246	205 (145, 265)	190 (136, 223)	5.26 (2.32,11.93)	-0.92(0.385)
CLASS E & F	170	98	72 (42, 103)	52 (40, 75)	4.23 (1.86, 9.60)	-0.80(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	92	95	-3 (-19, 13)	0 (-14, 9)	1.11 (0.49, 2.53)	0.20(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	67	42	25 (14, 37)	22 (12, 35)	2.10 (0.93, 4.77)	-0.64(0.385)
STATION 2	50	73	-23 (-38, -8)	-18 (-28, -6)	0.25 (0.11, 0.56)	0.44(0.385)
STATION 3	59	66	-7 (-20, 7)	-6 (-13, 7)	0.35 (0.15, 0.80)	0.12(0.385)
STATION 4	54	49	5 (-12, 22)	-4 (-10, 4)	6.97 (3.07,15.81)	0.28(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	130	86	44 (29, 58)	38 (29, 48)	3.02 (1.33, 6.85)	-0.84(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	80	48	31 (15, 47)	32 (20, 42)	1.16 (0.51, 2.62)	-0.68(0.385)
STATION 2	96	72	24 (9, 39)	18 (7, 35)	3.20 (1.41, 7.27)	-0.36(0.385)
STATION 3	103	51	52 (37, 67)	47 (37, 56)	3.63 (1.60, 8.24)	-0.92(0.385)
STATION 4	65	52	13 (4, 23)	11 (3, 21)	2.24 (0.99, 5.08)	-0.36(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	624	965	-341 (-404, -277)	-338 (-379, -285)	0.47 (0.21, 1.07)	1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	497	712	-215 (-283, -146)	-234 (-297, -135)	0.47 (0.21, 1.06)	0.64(0.385)
STATION 2	441	869	-428 (-516, -340)	-434 (-498, -318)	0.22 (0.10, 0.49)	0.96(0.385)
STATION 3	472	786	-314 (-385, -244)	-346 (-385, -269)	1.54 (0.68, 3.49)	0.84(0.385)
STATION 4	385	517	-132 (-197, -67)	-204 (-216, -104)	4.16 (1.83, 9.43)	0.68(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	515	845	-330 (-426, -233)	-329 (-405, -229)	0.49 (0.22, 1.11)	0.80(0.385)
2.5 TO 5.0	500	874	-374 (-425, -322)	-382 (-425, -327)	1.17 (0.52, 2.66)	0.96(0.385)
> 5.0 M/SEC	449	399	50 (-22, 123)	81 (0, 125)	0.54 (0.24, 1.23)	-0.48(0.385)
B. STABILITY GROUP						
CLASS A & B	475	877	-402 (-457, -347)	-418 (-456, -359)	1.34 (0.59, 3.04)	0.96(0.385)
CLASS C	479	785	-305 (-381, -230)	-301 (-366, -237)	0.55 (0.24, 1.24)	0.92(0.385)
CLASS D	524	614	-91 (-197, 15)	-73 (-140, 23)	0.25 (0.11, 0.56)	0.28(0.385)
CLASS E & F	137	23	113 (104, 123)	107 (100, 117)	9.49 (4.18,21.54)	-1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	913	1308	-395 (-568, -222)	-213 (-401, -158)	0.05 (0.02, 0.12)	0.92(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	710	946	-236 (-463, -9)	-65 (-235, 21)	0.12 (0.05, 0.27)	0.20(0.385)
STATION 2	727	1017	-290 (-389, -190)	-283 (-358, -175)	0.34 (0.15, 0.77)	0.68(0.385)
STATION 3	782	859	-77 (-195, 41)	-21 (-96, 45)	0.24 (0.11, 0.55)	0.32(0.385)
STATION 4	454	497	-43 (-128, 41)	14 (-72, 34)	0.44 (0.20, 1.01)	0.20(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	380	1138	-758 (-967, -549)	-597 (-718, -473)	0.06 (0.03, 0.13)	0.96(0.385)
2.5 TO 5.0	832	1012	-180 (-270, -90)	-144 (-235, -90)	0.49 (0.22, 1.11)	0.48(0.385)
> 5.0 M/SEC	802	637	165 (99, 231)	186 (94, 228)	0.94 (0.41, 2.13)	-0.64(0.385)
B. STABILITY GROUP						
CLASS A & B	654	1003	-348 (-433, -264)	-321 (-409, -256)	0.56 (0.25, 1.27)	0.84(0.385)
CLASS C	796	994	-198 (-366, -30)	-21 (-172, -3)	0.14 (0.06, 0.32)	0.36(0.385)
CLASS D	782	723	58 (-161, 278)	237 (68, 313)	0.07 (0.03, 0.15)	-0.64(0.385)
CLASS E & F	308	25	283 (246, 320)	259 (241, 273)	87.18 (38.42,197.8)	-1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	395	443	-48 (-106, 10)	-26 (-63, 1)	0.34 (0.15, 0.78)	0.32(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	308	258	50 (8, 92)	72 (-1, 98)	2.95 (1.30, 6.69)	-0.44(0.385)
STATION 2	241	377	-136 (-194, -77)	-138 (-178, -81)	0.85 (0.37, 1.93)	0.64(0.385)
STATION 3	257	330	-73 (-138, -8)	-38 (-99, -25)	0.49 (0.22, 1.11)	0.44(0.385)
STATION 4	204	202	2 (-49, 54)	-16 (-40, 2)	2.09 (0.92, 4.74)	0.48(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	276	321	-46 (-117, 26)	-86 (-118, 14)	1.49 (0.65, 3.37)	0.44(0.385)
2.5 TO 5.0	307	400	-93 (-151, -35)	-73 (-124, -40)	0.35 (0.16, 0.80)	0.52(0.385)
> 5.0 M/SEC	266	164	102 (62, 142)	90 (66, 136)	1.36 (0.60, 3.09)	-0.68(0.385)
B. STABILITY GROUP						
CLASS A & B	246	325	-78 (-131, -26)	-94 (-138, -46)	2.88 (1.27, 6.53)	0.68(0.385)
CLASS C	302	371	-69 (-137, -1)	-43 (-108, -14)	0.61 (0.27, 1.38)	0.44(0.385)
CLASS D	302	264	37 (-22, 97)	76 (21, 101)	0.31 (0.14, 0.71)	-0.56(0.385)
CLASS E & F	91	18	73 (63, 83)	77 (66, 80)	1.09 (0.48, 2.48)	-0.96(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	578	526	51 (-52, 155)	84 (26, 144)	0.18 (0.08, 0.42)	-0.48(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	377	376	1 (-124, 126)	59 (-20, 117)	0.20 (0.09, 0.45)	-0.40(0.385)
STATION 2	453	395	57 (-8, 122)	72 (8, 106)	1.08 (0.47, 2.45)	-0.40(0.385)
STATION 3	470	317	153 (95, 211)	155 (92, 201)	2.18 (0.96, 4.96)	-0.76(0.385)
STATION 4	274	186	89 (53, 124)	94 (58, 118)	1.36 (0.60, 3.09)	-0.68(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	191	330	-140 (-270, -9)	-52 (-104, -21)	0.13 (0.06, 0.29)	0.52(0.385)
2.5 TO 5.0	451	425	26 (-30, 82)	29 (-16, 67)	1.29 (0.57, 2.94)	-0.28(0.385)
> 5.0 M/SEC	522	263	259 (204, 314)	234 (198, 290)	2.69 (1.19, 6.12)	-0.96(0.385)
B. STABILITY GROUP						
CLASS A & B	316	367	-51 (-125, 23)	-69 (-116, -15)	1.54 (0.68, 3.49)	0.48(0.385)
CLASS C	438	359	130 (79, 180)	138 (81, 185)	1.14 (0.50, 2.58)	-0.76(0.385)
CLASS D	450	370	80 (-47, 207)	154 (74, 186)	0.23 (0.10, 0.52)	-0.64(0.385)
CLASS E & F	170	28	142 (113, 171)	129 (110, 137)	9.46 (4.17,21.46)	-1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	92	89	3 (-12, 18)	-1 (-9, 13)	1.60 (0.70, 3.63)	-0.20(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	67	42	25 (13, 38)	27 (14, 35)	1.36 (0.60, 3.08)	-0.64(0.385)
STATION 2	50	64	-15 (-28, -2)	-12 (-22, -1)	0.37 (0.16, 0.84)	0.36(0.385)
STATION 3	59	61	-2 (-16, 13)	-1 (-9, 14)	0.30 (0.13, 0.68)	-0.32(0.385)
STATION 4	54	39	15 (-1, 32)	8 (2, 13)	7.66 (3.37,17.38)	-0.40(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	130	84	46 (29, 62)	44 (33, 53)	1.33 (0.59, 3.02)	-0.84(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	80	56	24 (5, 42)	29 (12, 39)	0.64 (0.28, 1.44)	-0.56(0.385)
STATION 2	96	62	34 (19, 50)	28 (17, 45)	3.01 (1.33, 6.83)	-0.60(0.385)
STATION 3	103	52	51 (35, 66)	49 (36, 56)	3.28 (1.45, 7.44)	-0.84(0.385)
STATION 4	65	34	31 (22, 41)	31 (21, 39)	3.06 (1.35, 6.94)	-0.80(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	624	1976	-1352 (-1498, -1205)	-1304 (-1371, -1171)	0.07 (0.03, 0.15)	1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	497	1373	-876 (-1052, -699)	-772 (-878, -648)	0.05 (0.02, 0.12)	1.00(0.385)
STATION 2	441	1840	-1399 (-1553, -1245)	-1388 (-1471, -1216)	0.06 (0.03, 0.14)	1.00(0.385)
STATION 3	472	1192	-720 (-827, -614)	-728 (-767, -622)	0.37 (0.16, 0.83)	1.00(0.385)
STATION 4	385	618	-233 (-317, -149)	-272 (-282, -188)	0.91 (0.40, 2.07)	0.80(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	515	1680	-1165 (-1387, -944)	-1038 (-1347, -825)	0.07 (0.03, 0.16)	1.00(0.385)
2.5 TO 5.0	500	1658	-1158 (-1264, -1053)	-1141 (-1237, -1001)	0.15 (0.07, 0.35)	1.00(0.385)
> 5.0 M/SEC	449	958	-509 (-625, -394)	-460 (-607, -349)	0.17 (0.07, 0.38)	0.92(0.385)
B. STABILITY GROUP						
CLASS A & B	475	1065	-590 (-688, -492)	-566 (-670, -466)	0.22 (0.10, 0.50)	1.00(0.385)
CLASS C	479	1589	-1110 (-1280, -939)	-994 (-1198, -928)	0.08 (0.03, 0.18)	1.00(0.385)
CLASS D	524	1768	-1245 (-1404, -1086)	-1154 (-1375, -1039)	0.10 (0.04, 0.22)	1.00(0.385)
CLASS E & F	137	430	-293 (-380, -206)	-237 (-364, -168)	0.01 (0.00, 0.02)	1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	913	2393	-1480 (-1713, -1247)	-1343 (-1511, -1203)	0.03 (0.01, 0.06)	1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	710	1511	-801 (-1039, -563)	-662 (-942, -477)	0.11 (0.05, 0.25)	0.88(0.385)
STATION 2	727	2150	-1423 (-1698, -1149)	-1390 (-1569, -1035)	0.04 (0.02, 0.08)	1.00(0.385)
STATION 3	782	1412	-630 (-791, -465)	-611 (-717, -425)	0.12 (0.05, 0.27)	0.96(0.385)
STATION 4	454	693	-239 (-332, -145)	-250 (-304, -140)	0.34 (0.15, 0.77)	0.64(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	380	1724	-1344 (-1702, -986)	-1050 (-1358, -798)	0.02 (0.01, 0.04)	1.00(0.385)
2.5 TO 5.0	832	2059	-1226 (-1377, -1075)	-1202 (-1383, -1010)	0.14 (0.06, 0.31)	1.00(0.385)
> 5.0 M/SEC	802	921	-119 (-196, -41)	-109 (-184, -29)	0.54 (0.24, 1.22)	0.36(0.385)
B. STABILITY GROUP						
CLASS A & B	654	1036	-381 (-525, -237)	-220 (-379, -201)	0.15 (0.06, 0.33)	0.84(0.385)
CLASS C	796	1510	-714 (-914, -515)	-540 (-804, -449)	0.10 (0.04, 0.22)	0.88(0.385)
CLASS D	782	2246	-1465 (-1735, -1194)	-1441 (-1568, -1073)	0.04 (0.02, 0.10)	1.00(0.385)
CLASS E & F	308	502	-193 (-333, -54)	-88 (-270, -10)	0.07 (0.03, 0.17)	0.40(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	395	982	-587 (-682, -492)	-544 (-615, -468)	0.11 (0.05, 0.24)	1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	308	570	-263 (-355, -170)	-178 (-294, -167)	0.18 (0.08, 0.42)	0.84(0.385)
STATION 2	241	913	-672 (-781, -563)	-616 (-739, -525)	0.15 (0.07, 0.35)	1.00(0.385)
STATION 3	257	568	-311 (-386, -236)	-294 (-371, -222)	0.33 (0.14, 0.75)	0.96(0.385)
STATION 4	204	275	-71 (-126, -17)	-94 (-119, -44)	1.51 (0.66, 3.42)	0.64(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	276	570	-295 (-380, -209)	-290 (-349, -220)	0.71 (0.31, 1.62)	0.84(0.385)
2.5 TO 5.0	307	926	-619 (-730, -508)	-548 (-685, -454)	0.08 (0.03, 0.13)	1.00(0.385)
> 5.0 M/SEC	266	476	-210 (-295, -124)	-169 (-223, -104)	0.15 (0.07, 0.34)	0.72(0.385)
B. STABILITY GROUP						
CLASS A & B	246	399	-153 (-226, -80)	-143 (-188, -99)	0.61 (0.27, 1.38)	0.68(0.385)
CLASS C	302	787	-485 (-619, -350)	-417 (-524, -305)	0.11 (0.05, 0.25)	0.92(0.385)
CLASS D	302	801	-499 (-571, -426)	-444 (-549, -409)	0.19 (0.08, 0.43)	1.00(0.385)
CLASS E & F	91	215	-124 (-165, -83)	-88 (-131, -67)	0.03 (0.02, 0.08)	0.88(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (US/M**3)	AVERAGE PREDICTED VALUE (Cp) (US/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	578	900	-323 (-444, -201)	-242 (-325, -200)	0.13 (0.06, 0.29)	0.84(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	377	601	-224 (-361, -88)	-199 (-233, -119)	0.16 (0.07, 0.37)	0.68(0.385)
STATION 2	453	821	-369 (-458, -279)	-363 (-424, -272)	0.38 (0.17, 0.86)	0.88(0.385)
STATION 3	470	531	-61 (-124, 2)	-50 (-116, -12)	1.44 (0.63, 3.26)	0.48(0.385)
STATION 4	274	258	17 (-18, 51)	20 (-16, 49)	1.47 (0.65, 3.35)	-0.28(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	191	542	-352 (-524, -179)	-236 (-293, -171)	0.07 (0.03, 0.16)	0.88(0.385)
2.5 TO 5.0	451	786	-335 (-401, -269)	-367 (-398, -271)	0.68 (0.30, 1.53)	0.92(0.385)
> 5.0 M/SEC	522	506	16 (-44, 76)	10 (-38, 59)	1.49 (0.66, 3.39)	-0.12(0.385)
B. STABILITY GROUP						
CLASS A & B	316	383	-67 (-138, 3)	-72 (-130, -35)	2.01 (0.89, 4.57)	0.48(0.385)
CLASS C	488	624	-136 (-200, -71)	-172 (-192, -66)	0.47 (0.21, 1.07)	0.56(0.385)
CLASS D	450	861	-411 (-544, -278)	-371 (-444, -281)	0.21 (0.09, 0.47)	0.88(0.385)
CLASS E & F	170	217	-47 (-96, 2)	-47 (-71, 0)	0.46 (0.20, 1.04)	0.40(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	92	209	-117 (-138, -96)	-112 (-131, -93)	0.44 (0.19, 1.00)	0.96(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	67	110	-42 (-65, -20)	-31 (-47, -17)	0.22 (0.10, 0.49)	0.56(0.385)
STATION 2	50	192	-143 (-166, -120)	-139 (-154, -109)	0.10 (0.04, 0.22)	1.00(0.385)
STATION 3	59	122	-63 (-77, -49)	-60 (-72, -47)	0.34 (0.15, 0.76)	0.92(0.385)
STATION 4	54	55	-1 (-18, 16)	-13 (-18, 0)	6.56 (2.89,14.88)	0.32(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	130	182	-53 (-75, -31)	-46 (-60, -35)	0.46 (0.20, 1.04)	0.72(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	80	106	-26 (-49, -4)	-25 (-35, -9)	0.38 (0.17, 0.86)	0.44(0.385)
STATION 2	96	171	-75 (-96, -53)	-72 (-87, -55)	0.60 (0.26, 1.35)	0.88(0.385)
STATION 3	103	109	-6 (-23, 11)	-14 (-21, 2)	1.72 (0.76, 3.91)	0.28(0.385)
STATION 4	65	50	16 (6, 26)	15 (5, 24)	1.90 (0.84, 4.31)	-0.40(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	624	682	-57 (-137, 23)	-57 (-148, 51)	0.25 (0.11, 0.58)	0.36(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	497	373	124 (57, 191)	133 (98, 177)	0.51 (0.23, 1.16)	-0.72(0.385)
STATION 2	441	488	-47 (-130, 36)	-10 (-81, 44)	0.25 (0.11, 0.56)	-0.24(0.385)
STATION 3	472	516	-44 (-148, 61)	21 (-68, 52)	0.38 (0.17, 0.87)	-0.32(0.385)
STATION 4	385	312	73 (6, 140)	37 (2, 107)	3.21 (1.41, 7.28)	-0.32(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	515	416	99 (29, 170)	87 (29, 153)	1.63 (0.72, 3.70)	-0.40(0.385)
2.5 TO 5.0	500	650	-150 (-239, -61)	-145 (-250, -20)	0.23 (0.10, 0.51)	0.44(0.385)
> 5.0 M/SEC	449	224	225 (178, 272)	201 (165, 243)	6.69 (2.95,15.18)	-1.00(0.385)
B. STABILITY GROUP						
CLASS A & B	475	472	3 (-61, 67)	16 (-33, 57)	0.71 (0.31, 1.61)	-0.16(0.385)
CLASS C	479	605	-126 (-227, -24)	-73 (-228, 11)	0.25 (0.11, 0.56)	0.36(0.385)
CLASS D	524	163	361 (300, 421)	370 (311, 411)	1.49 (0.66, 3.38)	-0.96(0.385)
CLASS E & F	137	22	114 (105, 124)	109 (101, 117)	10.03 (4.42,22.76)	-1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	913	665	248 (154, 342)	281 (207, 363)	0.20 (0.09, 0.45)	-0.80(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	710	416	294 (203, 386)	321 (208, 369)	1.76 (0.78, 4.00)	-0.80(0.385)
STATION 2	727	487	239 (148, 330)	303 (203, 328)	0.43 (0.19, 0.98)	-0.84(0.385)
STATION 3	782	489	293 (188, 398)	361 (269, 405)	0.32 (0.14, 0.73)	-0.80(0.385)
STATION 4	454	269	185 (122, 248)	212 (136, 240)	1.23 (0.54, 2.80)	-0.76(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	380	385	-5 (-73, 62)	-9 (-61, 40)	1.07 (0.47, 2.43)	0.20(0.385)
2.5 TO 5.0	832	633	195 (89, 300)	304 (139, 324)	0.32 (0.14, 0.73)	-0.68(0.385)
> 5.0 M/SEC	802	298	504 (455, 553)	501 (444, 533)	12.85 (5.66,29.16)	-1.00(0.385)
B. STABILITY GROUP						
CLASS A & B	654	481	174 (102, 246)	242 (114, 257)	0.99 (0.43, 2.24)	-0.60(0.385)
CLASS C	796	584	212 (97, 328)	302 (158, 346)	0.35 (0.15, 0.79)	-0.64(0.385)
CLASS D	782	120	662 (601, 723)	661 (571, 714)	3.35 (1.47, 7.59)	-1.00(0.385)
CLASS E & F	308	25	283 (246, 320)	261 (242, 275)	29.91 (13.18,67.88)	-1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	395	312	83 (33, 132)	105 (55, 130)	0.52 (0.23, 1.19)	-0.64(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	308	157	151 (111, 191)	176 (93, 197)	4.86 (2.14,11.02)	-0.88(0.385)
STATION 2	241	255	-14 (-66, 38)	-n (-64, 20)	1.38 (0.61, 3.14)	0.44(0.385,
STATION 3	257	238	18 (-39, 75)	35 (-6, 66)	0.73 (0.32, 1.67)	-0.28(0.385)
STATION 4	204	129	75 (28, 123)	53 (30, 75)	4.11 (1.81, 9.32)	-0.68(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	276	178	98 (33, 162)	65 (19, 172)	2.66 (1.17, 6.03)	-0.44(0.385)
2.5 TO 5.0	307	293	13 (-36, 62)	61 (-6, 67)	0.56 (0.25, 1.28)	-0.32(0.385)
> 5.0 M/SEC	266	113	153 (119, 187)	139 (109, 172)	4.51 (1.99,10.24)	-0.96(0.385)
B. STABILITY GROUP						
CLASS A & B	246	240	6 (-52, 64)	-10 (-50, 33)	1.51 (0.67, 3.44)	0.36(0.385)
CLASS C	302	271	31 (-24, 85)	57 (-14, 78)	1.37 (0.61, 3.12)	-0.28(0.385)
CLASS D	302	110	192 (157, 227)	203 (156, 222)	2.05 (0.90, 4.64)	-0.96(0.385)
CLASS E & F	91	11	80 (70, 90)	80 (72, 85)	1.06 (0.47, 2.41)	-0.96(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	578	269	309 (263, 356)	310 (256, 343)	2.95 (1.30, 6.69)	-1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	377	188	189 (134, 243)	155 (124, 197)	6.47 (2.85,14.68)	-0.88(0.385)
STATION 2	453	218	235 (182, 288)	227 (175, 262)	3.93 (1.73, 8.93)	-0.92(0.385)
STATION 3	470	206	264 (208, 319)	267 (197, 309)	3.22 (1.42, 7.31)	-0.92(0.385)
STATION 4	274	108	166 (137, 196)	167 (129, 183)	5.38 (2.37,12.21)	-1.00(0.385)
3. BY METEOROLOGICAL CONDITION (A-5)						
A. WIND SPEED						
< 2.5 M/SEC	191	115	76 (29, 123)	51 (34, 72)	6.72 (2.96,15.25)	-0.68(0.385)
2.5 TO 5.0	451	265	186 (137, 235)	172 (136, 212)	2.96 (1.30, 6.71)	-0.88(0.385)
> 5.0 M/SEC	522	147	375 (325, 425)	351 (309, 402)	8.48 (3.74,19.25)	-1.00(0.385)
B. STABILITY GROUP						
CLASS A & B	316	200	115 (55, 176)	79 (32, 121)	14.94 (6.58,33.90)	-0.56(0.385)
CLASS C	488	236	252 (207, 297)	257 (199, 299)	1.99 (0.88, 4.51)	-0.92(0.385)
CLASS D	450	137	313 (251, 376)	316 (250, 338)	3.19 (1.41, 7.25)	-0.96(0.385)
CLASS E & F	170	9	161 (133, 189)	138 (126, 150)	139.3 (61.37,316.1)	-1.00(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	92	66	26 (13, 40)	25 (14, 31)	3.85 (1.69, 8.73)	-0.64(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	67	31	36 (25, 47)	31 (22, 45)	3.27 (1.44, 7.42)	-0.76(0.385)
STATION 2	50	50	-1 (-10, 8)	-3 (-9, 7)	1.06 (0.47, 2.41)	0.20(0.385)
STATION 3	59	49	10 (-1, 21)	11 (3, 20)	0.65 (0.29, 1.48)	-0.48(0.385)
STATION 4	54	28	27 (10, 43)	15 (12, 23)	15.15 (6.68,34.37)	-0.68(0.385)

TABLE A. COMPARISON OF 25 HIGHEST OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES (UNPAIRED IN TIME OR LOCATION)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

DATA SETS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	DIFFERENCE OF MEDIANS (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (FOBS-FPRED) (FRACTION)
1. ALL STATIONS/ALL EVENTS (A-4A)	130	54	75 (62, 89)	68 (58, 78)	8.53 (3.76,19.36)	-1.00(0.385)
2. BY STATION/ALL EVENTS (A-4B)						
STATION 1	80	37	43 (29, 57)	43 (30, 49)	3.04 (1.34, 6.89)	-0.80(0.385)
STATION 2	96	42	55 (41, 69)	51 (35, 63)	7.63 (3.36,17.31)	-0.92(0.385)
STATION 3	103	39	64 (50, 78)	58 (47, 66)	10.35 (4.56,23.50)	-1.00(0.385)
STATION 4	65	19	46 (38, 55)	44 (34, 50)	38.19 (16.83,86.67)	-1.00(0.385)

APPENDIX B

Statistics for All Events

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2977	72.1	57.7	14.5 (7.5, 21.5)	0.28(0.26, 0.30)	-0.74(0.035)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4061	66.3	58.2	8.1 (2.5, 13.7)	0.28(0.26, 0.30)	-0.66(0.030)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	825	84.5	40.7	43.8 (31.3, 56.3)	0.45(0.39, 0.52)	-0.84(0.067)
STATION 2	772	72.5	88.2	-15.7 (-32.7, 1.2)	0.16(0.14, 0.19)	-0.64(0.069)
STATION 3	1279	62.1	53.9	8.3 (-1.6, 18.1)	0.25(0.23, 0.28)	-0.71(0.054)
STATION 4	1165	54.0	55.4	-1.4 (-8.7, 5.9)	0.42(0.37, 0.47)	-0.50(0.056)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	1082	60.7	30.0	30.7 (21.5, 40.0)	0.43(0.38, 0.48)	-0.85(0.058)
2.5 TO 5.0	2215	63.9	72.5	-8.7 (-17.0, -0.4)	0.20(0.18, 0.21)	-0.61(0.041)
> 5.0 M/SEC	764	81.1	56.4	24.7 (13.5, 35.9)	0.59(0.52, 0.68)	-0.54(0.070)
B. STABILITY GROUP						
CLASS A & B	461	85.3	167.5	-82.1 (-110.8, -53.4)	0.17(0.14, 0.20)	-0.35(0.090)
CLASS C	801	79.5	131.7	-52.2 (-69.5, -34.8)	0.22(0.19, 0.25)	-0.38(0.068)
CLASS D	1953	66.4	23.6	42.8 (38.1, 47.5)	1.39(1.27, 1.52)	-0.74(0.044)
CLASS E & F	846	43.1	8.9	34.3 (30.9, 37.6)	0.35(0.31, 0.41)	-0.91(0.066)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2977	14.5 (5.7, 23.3)	0.83	192(187, 197)	192	109.2	0.03(0.00,0.07)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4061	8.1 (0.6, 15.6)	0.80	185(181, 189)	185	107.0	-0.04(-0.07,-.01)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	825	43.8 (29.1, 58.5)	0.91	181(173, 190)	186	108.9	0.03(-0.04,0.10)
STATION 2	772	-15.7 (-38.8, 7.3)	0.78	244(233, 257)	244	137.5	-0.05(-0.12,0.02)
STATION 3	1279	8.3 (-4.9, 21.4)	0.82	183(176, 190)	183	99.5	-0.04(-0.09,0.01)
STATION 4	1185	-1.4 (-12.3, 9.5)	0.70	136(131, 142)	136	94.0	-0.15(-0.20,-.09)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	1082	30.7 (19.9, 41.5)	0.91	158(152, 165)	161	84.8	-0.04(-0.10,0.02)
2.5 TO 5.0	2215	-8.7 (-19.2, 1.8)	0.76	203(197, 209)	203	116.9	-0.05(-0.09,-.01)
> 5.0 M/SEC	764	24.7 (11.1, 38.3)	0.74	161(154, 170)	163	109.9	-0.05(-0.12,0.02)
B. STABILITY GROUP							
CLASS A & B	461	-82.1 (-117.2, -47.0)	0.60	326(306, 348)	336	207.1	-0.11(-0.20,-.02)
CLASS C	801	-52.2 (-74.4, -29.9)	0.62	259(247, 272)	264	172.0	-0.10(-0.17,-.03)
CLASS D	1953	42.8 (35.0, 50.6)	0.85	112(109, 116)	120	81.2	-0.12(-0.16,-.08)
CLASS E & F	846	34.3 (28.1, 40.4)	0.95	55(52, 57)	65	50.6	-0.26(-0.32,-.19)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINSUM (1976) MODEL: MPTER AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2929	107.8	69.2	38.6 (29.9, 47.3)	0.60(0.56, 0.65)	-0.68(0.036)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4598	97.6	60.4	37.2 (31.1, 43.4)	0.64(0.61, 0.68)	-0.63(0.028)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	625	121.0	57.0	64.1 (44.8, 83.3)	0.76(0.65, 0.89)	-0.76(0.077)
STATION 2	981	126.3	81.0	45.3 (27.8, 62.8)	0.44(0.39, 0.50)	-0.72(0.061)
STATION 3	1571	98.3	49.8	48.6 (38.8, 58.3)	0.93(0.84, 1.02)	-0.63(0.049)
STATION 4	1421	66.7	59.3	7.4 (0.0, 14.8)	0.50(0.45, 0.55)	-0.51(0.051)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	861	68.7	21.9	46.8 (37.8, 55.8)	0.41(0.36, 0.47)	-0.88(0.066)
2.5 TO 5.0	2304	92.8	69.2	23.6 (14.2, 33.0)	0.49(0.45, 0.53)	-0.63(0.040)
> 5.0 M/SEC	1433	122.7	69.3	53.4 (42.3, 64.5)	1.11(1.00, 1.23)	-0.48(0.051)
B. STABILITY GROUP						
CLASS A & B	434	116.3	173.6	-57.3 (-91.4, -23.2)	0.30(0.25, 0.37)	-0.27(0.092)
CLASS C	945	133.2	123.6	9.6 (-8.7, 28.0)	0.55(0.49, 0.63)	-0.45(0.063)
CLASS D	2177	95.7	35.9	59.8 (53.3, 66.2)	2.02(1.85, 2.19)	-0.63(0.041)
CLASS E & F	1042	61.6	6.9	54.6 (50.6, 58.7)	1.96(1.74, 2.21)	-0.93(0.060)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2929	38.6 (27.1, 50.1)	0.81	238(232, 244)	241	145.9	0.02(-0.02,0.05)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4598	37.2 (29.0, 45.5)	0.79	217(213, 222)	220	135.5	-0.05(-0.08,-.02)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	625	64.1 (36.5, 91.6)	0.85	249(236, 263)	257	156.5	-0.03(-0.10,0.05)
STATION 2	981	45.3 (22.6, 67.9)	0.85	289(276, 302)	292	181.2	-0.07(-0.13,-.01)
STATION 3	1571	48.6 (35.8, 61.3)	0.81	200(193, 207)	205	125.6	-0.02(-0.07,0.03)
STATION 4	1421	7.4 (-3.4, 18.2)	0.71	151(145, 156)	151	105.6	-0.13(-0.18,-.08)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	861	46.8 (36.4, 57.2)	0.93	144(138, 151)	152	89.3	-0.16(-0.23,-.10)
2.5 TO 5.0	2304	23.6 (11.8, 35.4)	0.78	237(230, 244)	238	140.5	-0.06(-0.10,-.02)
> 5.0 M/SEC	1433	53.4 (37.9, 68.8)	0.73	219(212, 228)	226	155.1	-0.05(-0.10,0.00)
B. STABILITY GROUP							
CLASS A & B	434	-57.3 (-101.7, -12.9)	0.57	384(360, 411)	387	248.3	-0.14(-0.23,-.05)
CLASS C	945	9.6 (-12.4, 31.7)	0.68	300(287, 315)	300	205.2	-0.10(-0.16,-.03)
CLASS D	2177	59.8 (49.3, 70.2)	0.81	161(157, [illegible])	172	115.3	-0.11(-0.15,-.07)
CLASS E & F	1042	54.6 (48.7, 60.5)	0.95	72(69, 75)	90	67.4	-0.16(-0.22,-.11)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1026	62.4	51.7	10.6 (2.9, 18.3)	0.52(0.46, 0.59)	-0.56(0.060)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1489	55.1	50.6	4.5 (-1.4, 10.4)	0.52(0.47, 0.58)	-0.47(0.050)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	292	74.1	37.8	36.4 (22.5, 50.2)	1.01(0.80, 1.27)	-0.70(0.113)
STATION 2	298	57.9	74.6	-16.7 (-33.1, -0.2)	0.30(0.24, 0.38)	-0.44(0.111)
STATION 3	455	53.9	48.6	5.4 (-5.4, 16.1)	0.39(0.33, 0.47)	-0.55(0.090)
STATION 4	444	41.9	45.1	-3.2 (-10.7, 4.4)	0.85(0.70, 1.02)	-0.26(0.091)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	347	54.7	26.1	28.6 (18.0, 39.2)	1.28([illegible]04, 1.58)	-0.70(0.103)
2.5 TO 5.0	888	51.2	60.6	-9.5 (-17.5, -1.4)	0.32(0.28, 0.37)	-0.42(0.065)
> 5.0 M/SEC	254	69.6	49.2	20.4 (7.5, 33.4)	1.26(0.99, 1.62)	-0.35(0.121)
B. STABILITY GROUP						
CLASS A & B	166	65.1	118.7	-53.6 (-79.3, -27.9)	0.43(0.32, 0.58)	0.25(0.149)
CLASS C	376	62.2	94.7	-32.5 (-47.4, -17.6)	0.45(0.37, 0.55)	0.18(0.099)
CLASS D	703	54.6	25.5	29.1 (23.3, 34.9)	1.60(1.38, 1.86)	-0.57(0.073)
CLASS E & F	244	39.1	8.9	30.2 (25.6, 34.7)	0.66(0.52, 0.86)	-0.83(0.123)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1026	10.6 (1.2, 20.1)	0.71	120(115, 1^5)	120	82.7	0.10(0.04,0.16)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1489	4.5 (-3.2, 12.2)	0.66	117(113, 121)	117	80.4	-0.02(-0.07,0.03)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	292	36.4 (20.6, 52.1)	0.84	113(104, 123)	118	87.3	0.12(0.00,0.23)
STATION 2	298	-16.7 (-38.8, 5.5)	0.63	147(136, 160)	148	100.8	-0.04(-0.15,0.08)
STATION 3	455	5.4 (-8.0, 18.8)	0.71	119(111, 127)	119	76.7	-0.04(-0.13,0.06)
STATION 4	444	-3.2 (-13.8, 7.5)	0.53	87(82, 93)	87	66.0	-0.15(-0.24,-.06)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	347	28.6 (15.4, 41.7)	0.81	103(96, 112)	107	71.8	-0.06(-0.17,0.04)
2.5 TO 5.0	888	-9.5 (-19.4, 0.5)	0.63	124(118, 130)	124	85.2	-0.03(-0.09,0.04)
> 5.0 M/SEC	254	20.4 (4.5, 36.3)	0.60	101(93, 111)	103	75.3	0.08(-0.05,0.20)
B. STABILITY GROUP							
CLASS A & B	166	-53.6 (-79.3, -27.9)	0.47	165(150, 187)	174	126.9	0.02(-0.13,0.17)
CLASS C	376	-32.5 (-50.7, -14.3)	0.48	153(142, 164)	156	110.2	-0.08(-0.18,0.02)
CLASS D	703	29.1 (20.6, 37.5)	0.73	83(79, 88)	88	65.4	-0.13(-0.20,-.06)
CLASS E & F	244	30.2 (19.6, 40.8)	0.89	43(39, 47)	52	45.8	-0.41(-0.51,-.30)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1113	86.5	57.6	28.9 (19.8, 37.9)	1.10(0.98, 1.24)	-0.50(0.058)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1852	77.8	48.8	29.0 (22.8, 35.2)	1.20(1.10, 1.32)	-0.45(0.045)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	251	95.0	47.0	48.1 (28.7, 67.5)	1.21(0.94, 1.55)	-0.61(0.121)
STATION 2	405	99.0	65.1	33.9 (16.9, 50.9)	0.81(0.67, 0.99)	-0.56(0.096)
STATION 3	609	81.9	41.0	40.9 (30.5, 51.3)	1.87(1.59, 2.19)	-0.48(0.078)
STATION 4	587	51.6	46.4	5.1 (-1.9, 12.1)	1.07(0.91, 1.26)	-0.29(0.079)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	297	56.1	14.3	41.8 (33.0, 50.5)	1.15(0.91, 1.44)	-0.85(0.112)
2.5 TO 5.0	981	73.8	55.3	18.5 (9.8, 27.2)	0.83(0.74, 0.95)	-0.45(0.061)
> 5.0 M/SEC	574	95.9	55.6	40.3 (28.2, 52.5)	2.22(1.88, 2.61)	-0.26(0.080)
B. STABILITY GROUP						
CLASS A & B	179	77.6	112.9	-35.3 (-62.8, -7.8)	0.68(0.50, 0.91)	0.18(0.144)
CLASS C	408	109.7	90.7	19.0 (1.4, 36.7)	1.16(0.96, 1.41)	-0.25(0.095)
CLASS D	886	74.3	34.2	40.2 (33.0, 47.3)	2.52(2.21, 2.87)	-0.47(0.065)
CLASS E & F	379	51.7	7.7	43.9 (39.0, 48.9)	2.55(2.08, 3.12)	-0.85(0.099)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1113	28.9 (17.9, 39.9)	0.71	146(140, 152)	149	101.4	0.10(0.04,0.16)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1852	29.0 (21.1, 36.9)	0.70	135(131, 140)	138	95.8	0.00(-0.04,0.05)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	251	48.1 (19.9, 76.2)	0.77	159(146, 175)	166	115.5	-0.03(-0.16,0.09)
STATION 2	405	33.9 (13.6, 54.2)	0.76	175(164, 188)	178	126.4	-0.01(-0.11,0.09)
STATION 3	609	40.9 (28.2, 53.5)	0.75	128(121, 135)	134	91.9	0.05(-0.03,0.13)
STATION 4	587	5.1 (-4.7, 15.0)	0.58	90(85, 96)	90	70.4	-0.09(-0.17,-.01)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	297	41.8 (31.2, 52.3)	0.90	86(79, 93)	95	68.6	-0.25(-0.35,-.14)
2.5 TO 5.0	981	18.5 (8.0, 29.0)	0.67	139(134, 146)	141	98.2	-0.01(-0.07,0.05)
> 5.0 M/SEC	574	40.3 (24.1, 56.6)	0.64	147(139, 156)	153	105.9	0.01(-0.07,0.10)
B. STABILITY GROUP							
CLASS A & B	179	-35.3 (-66.3, -4.4)	0.42	192(174, 215)	195	142.2	-0.06(-0.20,0.09)
CLASS C	408	19.0 (-0.3, 38.4)	0.60	185(174, 199)	186	135.6	-0.04(-0.13,0.06)
CLASS D	886	40.2 (30.3, 50.0)	0.72	113(108, 118)	119	85.1	-0.09(-0.15,-.02)
CLASS E & F	379	43.9 (36.8, 51.1)	0.91	55(51, 59)	70	56.4	-0.26(-0.35,-.16)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	350	26.1	17.8	8.3 (4.6, 12.0)	0.83(0.67, 1.02)	-0.47(0.103)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	812	17.9	12.2	5.7 (3.7, 7.7)	0.80(0.70, 0.92)	-0.49(0.067)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	156	21.2	8.9	12.3 (7.7, 16.8)	1.98(1.44, 2.71)	-0.62(0.154)
STATION 2	171	17.2	16.5	0.6 (-4.3, 5.6)	0.34(0.25, 0.46)	-0.44(0.147)
STATION 3	245	19.0	11.6	7.4 (3.9, 10.9)	0.53(0.45, 0.74)	-0.59(0.123)
STATION 4	240	15.0	11.8	3.2 (0.0, 6.4)	1.42(1.10, 1.84)	-0.37(0.124)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	350	8.3 (4.0, 12.6)	0.69	31(29, 34)	33	22.9	0.20(0.09,0.30)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	812	5.7 (3.4, 8.0)	0.70	26(25, 28)	27	18.8	0.14(0.07,0.21)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	156	12.3 (6.9, 17.6)	0.79	27(24, 31)	30	21.5	0.13(-0.03,0.28)
STATION 2	171	0.6 (-4.8, 6.1)	0.63	30(27, 34)	30	20.6	0.17(0.02,0.31)
STATION 3	245	7.4 (3.6, 11.3)	0.78	25(23, 28)	26	18.8	0.17(0.05,0.29)
STATION 4	240	3.2 (-0.7, 7.1)	0.62	23(21, 26)	23	15.7	0.15(0.03,0.28)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS		
				DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	336	35.0	21.3	13.7 (9.1, 18.3)	1.89(1.52, 2.34)	-0.38(0.105)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	795	25.9	14.5	11.5 (9.0, 13.9)	2.00(1.74, 2.29)	-0.40(0.068)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	131	25.3	11.3	14.0 (7.6, 20.5)	1.92(1.36, 2.71)	-0.60(0.168)
STATION 2	178	31.1	18.6	12.5 (6.3, 18.7)	1.55(1.15, 2.08)	-0.43(0.144)
STATION 3	246	29.3	13.3	16.0 (11.5, 20.5)	3.28(2.55, 4.22)	-0.41(0.123)
STATION 4	240	19.1	14.4	4.6 (1.3, 8.0)	1.35(1.05, 1.74)	-0.33(0.124)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	336	13.7 (9.1, 18.2)	0.71	37(3[illegible], 40)	39	27.9	0.28(0.17,0.37)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	795	11.5 (8.8, 14.1)	0.71	33(31, 34)	35	24.2	0.16(0.09,0.22)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	131	14.0 (5.9, 22.2)	0.75	35(31, 40)	38	26.7	0.14(-0.04,0.30)
STATION 2	178	12.5 (6.2, 18.7)	0.71	40(36, 44)	42	30.0	0.10(-0.05,0.24)
STATION 3	246	16.0 (11.6, 20.4)	0.77	32(30, 36)	36	25.2	0.21(0.09,0.33)
STATION 4	240	4.6 (1.1, 8.2)	0.64	24(22, 26)	24	17.4	0.18(0.06,0.30)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2997	71.7	49.7	22.0 (15.7, 28.3)	0.37(0.34, 0.39)	-0.72(0.035)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4120	65.4	52.9	12.5 (7.3, 17.6)	0.34(0.32, 0.36)	-0.63(0.030)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	861	81.2	42.5	38.7 (27.2, 50.2)	0.53(0.47, 0.61)	-0.76(0.066)
STATION 2	831	67.5	83.2	-15.7 (-29.9, -1.4)	0.22(0.19, 0.25)	-0.53(0.067)
STATION 3	1296	61.4	50.0	11.3 (2.2, 20.5)	0.30(0.27, 0.33)	-0.67(0.053)
STATION 4	1132	56.3	41.8	14.5 (7.4, 21.7)	0.49(0.43, 0.55)	-0.57(0.057)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	1162	56.8	46.5	10.3 (0.3, 20.3)	0.30(0.26, 0.33)	-0.72(0.056)
2.5 TO 5.0	2222	63.7	62.9	0.8 (-6.5, 8.0)	0.27(0.25, 0.29)	-0.59(0.041)
> 5.0 M/SEC	736	84.0	32.8	51.3 (41.9, 60.6)	1.28(1.10, 1.47)	-0.63(0.071)
B. STABILITY GROUP						
CLASS A & B	473	83.3	155.7	-72.4 (-97.4, -47.5)	0.22(0.19, 0.27)	-0.33(0.088)
CLASS C	817	78.1	117.0	-38.9 (-54.0, -23.7)	0.29(0.25, 0.33)	-0.35(0.067)
CLASS D	2012	64.5	24.0	40.5 (35.4, 45.6)	0.92(0.84, 1.00)	-0.68(0.043)
CLASS E & F	618	44.4	0.5	43.9 (42.2, 45.7)	46.32(40.38,53.13)	-0.98(0.067)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2997	22.0 (13.8, 30.3)	0.83	173(169, 178)	175	101.4	0.03(-0.01,0.07)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4120	12.5 (5.4, 19.6)	0.79	173(169, 177)	173	102.1	-0.06(-0.09,-.03)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	861	38.7 (24.1, 53.3)	0.87	173(166, 182)	178	107.8	-0.02(-0.09,0.05)
STATION 2	831	-15.7 (-36.1, 4.8)	0.72	217(207, 228)	217	129.3	-0.10(-0.16,-.03)
STATION 3	1296	11.3 (-1.1, 23.7)	0.82	171(165, 178)	172	96.0	-0.05(-0.10,0.01)
STATION 4	1132	14.5 (4.3, 24.7)	0.75	128(123, 134)	129	84.8	-0.11(-0.16,-.05)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	1162	10.3 (-2.4, 23.1)	0.83	181(174, 189)	181	95.8	-0.10(-0.16,-.04)
2.5 TO 5.0	2222	0.8 (-8.5, 10.0)	0.76	178(173, 184)	178	107.5	-0.05(-0.09,0.00)
> 5.0 M/SEC	736	51.3 (39.7, 62.8)	0.61	130(124, 138)	140	95.8	-0.02(-0.09,0.05)
B. STABILITY GROUP							
CLASS A & B	473	-72.4 (-102.1, -42.7)	0.59	289(272, 309)	297	193.9	-0.12(-0.20,-.03)
CLASS C	817	-38.9 (-58.5, -19.2)	0.60	232(222, 244)	235	159.1	-0.13(-0.19,-.06)
CLASS D	2012	40.5 (33.0, 47.9)	0.84	124(120, 128)	130	80.8	-0.14(-0.18,-.10)
CLASS E & F	818	43.9 (41.1, 46.8)	0.99	25(24, 27)	51	44.5	-0.10(-0.17,-.03)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2928	107.9	59.1	48.8 (40.3, 57.2)	0.66(0.62, 0.71)	-0.69(0.036)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4616	97.3	52.9	44.3 (38.3, 50.3)	0.68(0.64, 0.72)	-0.63(0.028)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	655	115.7	68.8	46.9 (26.0, 67.8)	0.52(0.45, 0.61)	-0.67(0.075)
STATION 2	1016	122.1	70.6	51.5 (35.9, 67.0)	0.59(0.52, 0.66)	-0.63(0.060)
STATION 3	1576	98.0	46.0	52.1 (42.2, 61.9)	0.88(0.80, 0.98)	-0.63(0.048)
STATION 4	1369	69.1	40.3	28.9 (22.2, 35.5)	0.76(0.69, 0.85)	-0.57(0.052)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	924	64.4	55.7	8.7 (-6.1, 23.5)	0.11(0.10, 0.12)	-0.75(0.063)
2.5 TO 5.0	2308	92.7	57.5	35.2 (26.8, 43.7)	0.69(0.63, 0.74)	-0.63(0.040)
> 5.0 M/SEC	1384	126.9	43.6	83.3 (73.2, 93.3)	2.07(1.86, 2.30)	-0.56(0.052)
B. STABILITY GROUP						
CLASS A & B	446	113.4	169.9	-56.6 (-87.2, -25.9)	0.38(0.32, 0.46)	-0.25(0.091)
CLASS C	958	131.4	110.8	20.6 (2.9, 38.3)	0.60(0.53, 0.68)	-0.44(0.062)
CLASS D	2195	94.9	28.2	66.8 (59.9, 73.6)	1.44(1.32, 1.57)	-0.63(0.041)
CLASS E & F	1017	63.0	0.5	62.5 (59.2, 65.9)	202.8(179.3,229.4)	-0.98(0.060)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2928	48.8 (37.0, 60.5)	0.82	233(227, 239)	238	138.5	0.00(-0.04,0.03)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4616	44.3 (35.9, 52.7)	0.80	215(210, 219)	219	130.2	-0.06(-0.09,-.03)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	655	46.9 (15.7, 78.2)	0.81	280(266, 297)	284	160.1	-0.06(-0.14,0.02)
STATION 2	1016	51.5 (29.4, 73.6)	0.82	265(254, 277)	270	169.6	-0.10(-0.17,-.04)
STATION 3	1576	52.1 (38.7, 65.4)	0.81	205(198, 212)	211	125.7	-0.05(-0.10,0.00)
STATION 4	1369	28.9 (19.9, 37.8)	0.76	131(126, 136)	134	91.9	-0.09(-0.15,-.04)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	924	8.7 (-10.2, 27.5)	0.85	240(229, 251)	240	114.1	-0.16(-0.22,-.10)
2.5 TO 5.0	2308	35.2 (24.4, 46.1)	0.79	213(207, 219)	216	129.9	-0.06(-0.10,-.02)
> 5.0 M/SEC	1384	83.3 (68.8, 97.8)	0.78	193(186, 2[illegible])	210	141.6	-0.02(-0.07,0.03)
B. STABILITY GROUP							
CLASS A & B	446	-56.6 (-97.7, -15.5)	0.55	351(330, 376)	356	239.5	-0.15(-0.24,-.06)
CLASS C	958	20.6 (-0.4, 41.5)	0.67	295(283, 309)	296	194.8	-0.12(-0.19,-.06)
CLASS D	2195	66.8 (56.9, 76.6)	0.81	171(166, 177)	184	110.9	-0.11(-0.15,-.06)
CLASS E & F	1017	62.5 (57.3, 67.7)	0.99	55(53, 57)	83	63.1	-0.11(-0.17,-.05)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1010	63.3	44 9	18.4 (11.2, 25.6)	0.65(0.57, 0.74)	-0.57(0.061)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1467	55.9	47.1	8.8 (3.1, 14.5)	0.60(0.54, 0.67)	-0.46(0.050)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	310	70.3	38.2	32.1 (19.4, 44.9)	1.18(0.94, 1.47)	-0.62(0.109)
STATION 2	327	53.0	68.8	-15.7 (-29.9, -1.6)	0.38(0.31, 0.47)	-0.32(0.106)
STATION 3	445	54.9	46.0	8.8 (-1.5, 19.2)	0.45(0.38, 0.55)	-0.53(0.091)
STATION 4	385	47.7	37.0	10.7 (2.5, 19.0)	0.91(0.74, 1.11)	-0.41(0.098)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	378	50.7	42.4	8.3 (-3.5, 20.2)	0.64(0.52, 0.79)	-0.58(0.099)
2.5 TO 5.0	864	52.4	52.8	-0.4 (-7.8, 6.9)	0.44(0.38, 0.50)	-0.42(0.065)
> 5.0 M/SEC	225	77.7	32.8	44.9 (32.1, 57.7)	2.00(1.53, 2.59)	-0.50(0.128)
B. STABILITY GROUP						
CLASS A & B	171	63.2	109.0	-45.8 (-68.2, -23.4)	0.60(0.45, 0.82)	0.26(0.147)
CLASS C	369	63.5	85.7	-22.3 (-36.1, -8.4)	0.58(0.47, 0.71)	-0.18(0.100)
CLASS D	703	54.5	26.3	28.1 (21.7, 34.6)	1.03(0.89, 1.19)	-0.54(0.073)
CLASS E & F	224	42.0	1.2	40.8 (37.8, 43.8)	8.00(6.15,10.41)	-0.96(0.129)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1010	18.4 (9.9, 26.9)	0.75	111(106, 116)	112	77.8	0.11(0.05,0.17)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1467	8.8 (1.5, 16.1)	0.69	113(109, 118)	114	79.0	-0.05(-0.10,0.00)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	310	32.1 (17.2, 47.1)	0.79	111(103, 120)	115	85.2	0.06(-0.05,0.17)
STATION 2	327	-15.7 (-34.1, 2.7)	0.58	135(126, 147)	136	94.0	-0.09(-0.20,0.02)
STATION 3	445	8.8 (-4.3, 22.0)	0.74	114(107, 122)	114	76.4	-0.05(-0.14,0.05)
STATION 4	385	10.7 (-0.2, 21.7)	0.64	87(82, 94)	88	64.3	-0.13(-0.23,-.03)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	378	8.3 (-5.6, 22.2)	0.73	124(116, 134)	124	82.1	-0.12(-0.22,-.02)
2.5 TO 5.0	864	-0.4 (-9.4, 8.6)	0.65	111(106, 117)	111	78.7	-0.02(-0.09,0.04)
> 5.0 M/SEC	225	44.9 (29.3, 60.6)	0.78	94(86, 104)	104	75.1	0.09(-0.05,0.21)
B. STABILITY GROUP							
CLASS A & B	171	-45.8 (-67.9, -23.7)	0.44	147(133, 165)	153	116.1	0.03(-0.12,0.18)
CLASS C	369	-22.3 (-39.3, -5.3)	0.49	143(133, 154)	144	103.8	-0.11(-0.21,-.01)
CLASS D	703	28.1 (19.6, 36.7)	0.76	94(89, 99)	98	68.6	-0.17(-0.24,-.10)
CLASS E & F	224	40.8 (36.7, 45.0)	0.98	24(22, 26)	47	42.3	-0.20(-0.32,-.07)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1090	88.1	49.5	38.6 (29.4, 47.8)	1.10(0.97, 1.23)	-0.52(0.058)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1801	79.8	43.4	36.4 (30.0, 42.7)	1.18(1.08, 1.30)	-0.48(0.045)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	266	89.9	55.9	34.1 (12.4, 55.8)	0.67(0.53, 0.86)	-0.53(0.118)
STATION 2	424	94.8	55.6	39.1 (24.0, 54.3)	1.11(0.92, 1.35)	-0.52(0.093)
STATION 3	581	85.4	38.9	46.5 (35.6, 57.4)	1.76(1.49, 2.07)	-0.55(0.080)
STATION 4	530	56.5	32.2	24.2 (17.4, 31.1)	1.66(1.40, 1.96)	-0.41(0.084)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	319	52.7	32.3	20.5 (5.7, 35.2)	0.21(0.17, 0.26)	-0.74(0.108)
2.5 TO 5.0	961	75.1	50.9	24.2 (15.7, 32.6)	1.00(0.88, 1.13)	-0.46(0.062)
> 5.0 M/SEC	521	105.0	36.3	68.6 (56.5, 80.7)	3.93(3.31, 4.67)	-0.44(0.084)
B. STABILITY GROUP						
CLASS A & B	183	76.1	106.8	-30.7 (-56.2, -5.2)	0.82(0.62, 1.10)	0.19(0.142)
CLASS C	413	108.4	79.4	29.0 (12.6, 45.3)	1.62(1.33, 1.96)	-0.23(0.095)
CLASS D	851	77.0	29.7	47.3 (39.0, 55.7)	1.26(1.10, 1.44)	-0.52(0.066)
CLASS E & F	354	54.8	1.5	53.3 (48.9, 57.7)	22.35(18.13,27.54)	-0.97(0.102)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1990	38.6 (27.5, 49.7)	0.75	151(145, 157)	155	101.4	0.05(-0.01,0.11)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1801	36.4 (28.3, 44.4)	0.73	139(135, 144)	144	96.4	-0.03(-0.08,0.01)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	266	34.1 (7.9, 60.3)	0.73	186(171, 203)	189	116.6	-0.06(-0.18,0.06)
STATION 2	424	39.1 (19.0, 59.3)	0.74	165(154, 177)	169	119.8	-0.07(-0.16,0.03)
STATION 3	581	46.5 (32.4, 60.6)	0.78	135(128, 143)	143	98.6	-0.02(-0.10,0.07)
STATION 4	530	24.2 (15.3, 33.2)	0.68	83(78, 88)	86	65.1	-0.06(-0.14,0.03)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	319	20.5 (4.2, 36.7)	0.83	143(133, 155)	144	80.3	-0.19(-0.29,-.08)
2.5 TO 5.0	961	24.2 (13.7, 34.6)	0.69	135(129, 141)	137	96.0	-0.02(-0.08,0.04)
> 5.0 M/SEC	521	68.6 (52.1, 85.2)	0.74	140(132, 149)	156	106.9	0.01(-0.07,0.10)
B. STABILITY GROUP							
CLASS A & B	183	-30.7 (-59.4, -2.0)	0.42	183(166, 205)	185	137.1	-0.09(-0.24,0.05)
CLASS C	413	29.0 (11.6, 46.3)	0.60	174(163, 187)	176	129.1	-0.06(-0.15,0.04)
CLASS D	851	47.3 (36.7, 58.0)	0.76	131(125, 138)	139	89.0	-0.11(-C.18,-.05)
CLASS E & F	354	53.3 (48.3, 58.3)	0.98	43(40, 47)	69	55.0	-0.10(-0.20,0.01)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	352	26.0	14.9	11.0 (7.6, 14.5)	1.09(0.89, 1.35)	-0.47(0.103)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	812	17.9	11.3	6.6 (4.8, 8.5)	0.98(0.85, 1.12)	-0.46(0.067)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	160	20.7	9.5	11.2 (6.7, 15.7)	1.92(1.40, 2.62)	-0.51(0.152)
STATION 2	178	16.6	16.1	0.5 (-3.8, 4.8)	0.47(0.35, 0.63)	-0.34(0.144)
STATION 3	247	18.9	11.0	7.9 (4.6, 11.3)	0.65(0.50, 0.83)	-0.55(0.122)
STATION 4	227	15.8	9.0	6.8 (3.7, 9.9)	2.19(1.69, 2.85)	-0.44(0.128)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	352	11.0 (7.4, 14.7)	0.76	27(26, 30)	30	21.1	0.30(0.20,0.39)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	812	6.6 (4.5, 8.8)	0.72	25(24, 27)	26	18.1	0.13(0.06,0.20)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	160	11.2 (5.8, 16.5)	0.79	27(24, 30)	29	20.8	0.14(-0.02,0.29)
STATION 2	178	0.5 (-3.7, 4.8)	0.60	28(25, 31)	28	19.5	0.07(-0.08,0.22)
STATION 3	247	7.9 (4.3, 11.5)	0.78	24(22, 27)	26	18.4	0.18(0.05,0.30)
STATION 4	227	6.8 (2.6, 11.0)	0.69	21(20, 24)	22	14.6	0.19(0.06,0.31)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	338	34.8	18.2	16.5 (12.0, 21.1)	2.05(1.66, 2.54)	-0.36(0.105)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	799	25.8	12.7	13.1 (10.7, 15.5)	2.28(1.98, 2.62)	-0.38(0.068)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	137	24.3	13.7	10.6 (3.9, 17.3)	1.35(0.96, 1.90)	-0.48(0.164)
STATION 2	182	30.5	16.3	14.1 (8.4, 19.9)	2.11(1.57, 2.83)	-0.40(0.143)
STATION 3	245	29.4	12.5	16.9 (12.4, 21.4)	3.26(2.54, 4.19)	-0.43(0.123)
STATION 4	235	19.4	9.5	9.9 (6.9, 12.8)	3.01(2.33, 3.89)	-0.37(0.125)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	338	16.5 (11.8, 21.3)	0.74	38(35, 41)	41	28.6	0.22(0.11,0.31)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	799	13.1 (10.4, 15.8)	0.73	33(31, 34)	35	23.9	0.12(0.06,0.19)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	137	10.6 (2.3, 18.9)	0.68	36(32, 40)	37	25.4	0.21(0.04,0.36)
STATION 2	182	14.1 (7.6, 20.6)	0.71	40(36, 44)	42	29.7	-0.01(-0.15,0.14)
STATION 3	245	16.9 (12.1, 21.6)	0.79	34(31, 37)	38	26.1	0.12(-0.01,0.24)
STATION 4	235	9.9 (6.9, 12.9)	0.71	21(19, 23)	23	16.3	0.19(0.06,0.31)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	3370	64.5	136.2	-71.7 (-82.2, -61.1)	0.09(0.08, 0.09)	-0.49(0.033)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	5102	53.7	142.9	-89.2 (-97.1, -81.4)	0.08(0.08, 0.09)	-0.30(0.027)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	1033	68.4	126.5	-58.1 (-76.0, -40.2)	0.12(0.11, 0.14)	-0.42(0.060)
STATION 2	1232	47.0	260.6	-213.6 (-235.4,-191.8)	0.04(0.04, 0.05)	0.38(0.055)
STATION 3	1576	51.6	124.4	-72.8 (-84.7, -60.9)	0.11(0.10, 0.12)	-0.38(0.048)
STATION 4	1261	51.0	64.7	-13.7 (-21.4, -5.9)	0.31(0.28, 0.35)	-0.39(0.054)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	1298	51.5	114.6	-63.1 (-80.2, -45.9)	0.07(0.06, 0.08)	-0.56(0.053)
2.5 TO 5.0	2846	50.8	160.8	-110.1 (-120.7, -99.4)	0.07(0.07, 0.08)	0.23(0.036)
> 5.0 M/SEC	958	65.5	128.1	-62.6 (-76.7, -48.6)	0.21(0.18, 0.23)	0.18(0.062)
B. STABILITY GROUP						
CLASS A & B	519	76.4	177.6	-101.2 (-127.4, -74.9)	0.17(0.14, 0.20)	0.18(0.084)
CLASS C	999	64.7	218.2	-153.5 (-174.8,-132.1)	0.09(0.08, 0.10)	0.29(0.061)
CLASS D	2716	49.1	149.0	-99.9 (-110.8, -89.1)	0.07(0.07, 0.08)	-0.23(0.037)
CLASS E & F	868	42.2	16.6	25.5 (19.8, 31.3)	0.10(0.08, 0.11)	-0.89(0.065)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	3370	-71.7 (-85.7, -57.6)	0.67	312(305, 320)	320	164.9	-0.01(-0.04,0.02)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	5102	-89.2 (-100.6, -77.9)	0.57	294(288, 300)	307	167.3	-0.10(-0.13,-.08)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	1033	-58.1 (-81.9, -34.3)	0.67	301(288, 314)	306	163.4	-0.07(-0.13,-.01)
STATION 2	1232	-213.6 (-243.3,-183.9)	0.38	399(384, 416)	453	269.5	-0.13(-0.19,-.08)
STATION 3	1576	-72.8 (-89.4, -56.2)	0.60	246(238, 255)	256	145.6	-0.07(-0.12,-.02)
STATION 4	1261	-13.7 (-25.5, -1.8)	0.65	150(144, 156)	150	97.6	-0.16(-0.22,-.11)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	1298	-63.1 (-84.8, -41.3)	0.72	323(311, 336)	329	153.0	-0.11(-0.17,-.06)
2.5 TO 5.0	2846	-110.1 (-124.9, -95.3)	0.53	297(290, 305)	317	179.8	-0.10(-0.13,-.06)
> 5.0 M/SEC	958	-62.6 (-81.9, -43.3)	0.50	231(221, 241)	239	149.2	-0.11(-0.17,-.05)
B. STABILITY GROUP							
CLASS A & B	519	-101.2 (-134.9, -67.5)	0.51	314(296, 334)	330	204.7	-0.09(-0.18,0.00)
CLASS C	999	-153.5 (-182.8,-124.2)	0.40	354(339, 371)	386	228.9	-0.11(-0.17,-.05)
CLASS D	2716	-99.9 (-114.6, -85.2)	0.53	298(290, 306)	314	172.5	-0.15(-0.19,-.11)
CLASS E & F	868	25.5 (18.4, 32.7)	0.93	92(88, 97)	96	57.4	-0.27(-0.33,-.20)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	3325	95.8	149.2	-53.4 (-65.2, -41.6)	0.20(0.19, 0.21)	-0.42(0.033)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	5545	81.8	138.8	-57.0 (-65.2, -48.9)	0.20(0.19, 0.21)	-0.29(0.026)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	840	91.2	163.7	-72.5 (-96.5, -48.4)	0.21(0.18, 0.24)	-0.30(0.066)
STATION 2	1427	88.4	230.4	-142.0 (-163.1,-120.9)	0.13(0.12, 0.15)	0.22(0.051)
STATION 3	1813	85.8	118.9	-33.1 (-45.5, -20.7)	0.31(0.29, 0.34)	-0.34(0.045)
STATION 4	1465	64.9	60.0	4.9 (-2.7, 12.5)	0.43(0.39, 0.48)	-0.42(0.050)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	983	60.7	100.6	-39.9 (-61.4, -18.4)	0.04(0.04, 0.05)	-0.64(0.061)
2.5 TO 5.0	2879	75.3	156.4	-81.1 (-93.1, -69.1)	0.16(0.15, 0.18)	-0.27(0.036)
> 5.0 M/SEC	1683	105.1	131.0	-25.9 (-37.3, -14.5)	0.65(0.59, 0.71)	-0.13(0.047)
B. STABILITY GROUP						
CLASS A & B	483	104.8	179.7	-74.8 (-104.1, -45.5)	0.36(0.30, 0.43)	0.14(0.088)
CLASS C	1121	113.1	177.4	-64.2 (-83.8, -44.7)	0.32(0.28, 0.36)	-0.13(0.057)
CLASS D	2870	73.8	162.6	-88.8 (-100.9, -76.7)	0.14(0.13, 0.15)	0.17(0.036)
CLASS E & F	1071	60.0	16.4	43.6 (37.1, 50.0)	0.35(0.31, 0.39)	-0.89(0.059)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES - PAIRED COMPARISONS					
		BIAS		CHARACTERISTIC DISCREPANCIES			
DATA SETS	NUMBER OF EVENTS	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	3325	-53.4 (-68.6, -38.2)	0.64	350(342, 359)	354	189.6	-0.02(-0.05,0.02)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	5545	-57.0 (-68.5, -45.6)	0.59	317(311, 323)	322	177.7	-0.08(-0.10,-.05)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	840	-72.5 (-104.6, -40.3)	0.57	365(348, 383)	372	214.1	-0.07(-0.14,0.00)
STATION 2	1427	-142.0 (-170.5,-113.5)	0.46	419(404, 435)	442	252.0	-0.10(-0.15,-.05)
STATION 3	1813	-33.1 (-51.1, -15.2)	0.64	279(270, 288)	281	162.9	-0.09(-0.13,-.04)
STATION 4	1465	4.9 (-6.9, 16.8)	0.68	159(154, 165)	159	103.0	-0.17(-0.22,-.12)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	983	-39.9 (-65.0, -14.7)	0.79	349(335, 365)	351	152.1	-0.08(-0.14,-.01)
2.5 TO 5.0	2879	-81.1 (-97.3, -64.9)	0.56	342(333, 351)	351	193.8	-0.11(-0.15,-.08)
> 5.0 M/SEC	1683	-25.9 (-41.5, -10.3)	0.54	241(233, 250)	243	165.3	-0.02(-0.07,0.02)
B. STABILITY GROUP							
CLASS A & B	483	-74.8 (-116.3, -33.4)	0.50	351(330, 375)	359	237.7	-0.16(-0.25,-.07)
CLASS C	1121	-64.2 (-88.3, -40.2)	0.51	352(338, 367)	358	221.5	-0.13(-0.19,-.07)
CLASS D	2870	-88.8 (-105.6, -72.0)	0.52	339(331, 349)	351	189.0	-0.07(-0.11,-.04)
CLASS E & F	1071	43.6 (35.8, 51.3)	0.93	115(111, 121)	123	74.7	-0.17(-0.23,-.11)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1212	54.2	121.7	-67.5 (-78.9, -56.1)	0.14(0.12, 0.15)	-0.33(0.055)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	2042	41.8	116.8	-75.0 (-82.7, -67.3)	0.14(0.13, 0.15)	0.31(0.043)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	409	54.6	104.6	-50.0 (-67.2, -32.8)	0.24(0.20, 0.30)	-0.24(0.095)
STATION 2	547	34.0	193.6	-159.6 (-178.8,-140.4)	0.07(0.06, 0.08)	0.54(0.082)
STATION 3	614	41.7	103.9	-62.2 (-74.1, -50.3)	0.17(0.15, 0.20)	0.30(0.078)
STATION 4	472	39.9	55.2	-15.3 (-23.5, -7.1)	0.55(0.46, 0.66)	-0.19(0.089)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	460	42.9	89.4	-46.4 (-61.7, -31.1)	0.20(0.17, 0.24)	-0.37(0.090)
2.5 TO 5.0	1234	38.4	129.2	-90.8 (-101.2, -80.5)	0.10(0.09, 0.11)	0.36(0.055)
> 5.0 M/SEC	348	52.4	109.2	-56.8 (-73.0, -40.5)	0.29(0.23, 0.35)	0.27(0.103)
B. STABILITY GROUP						
CLASS A & B	187	58.1	125.1	-67.0 (-91.3, -42.7)	0.38(0.29, 0.51)	0.32(0.141)
CLASS C	480	49.9	152.4	-102.5 (-121.5, -83.6)	0.15(0.12, 0.18)	0.39(0.088)
CLASS D	1103	36.9	122.2	-85.2 (-95.4, -75.0)	0.11(0.10, 0.12)	0.35(0.058)
CLASS E & F	272	35.9	26.6	9.3 (0.6, 18.1)	0.12(0.09, 0.15)	-0.70(0.117)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1212	-67.5 (-82.2, -52.8)	0.52	200(193, 209)	211	129.3	0.04(-0.02,0.09)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	2042	-75.0 (-85.7, -64.3)	0.42	181(176, 187)	196	123.5	-0.07(-0.11,-.02)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	409	-50.0 (-72.5, -27.6)	0.54	181(169, 194)	187	120.9	-0.05(-0.15,0.05)
STATION 2	547	-159.6 (-183.9,-135.4)	0.23	232(219, 246)	281	188.5	-0.06(-0.14,0.02)
STATION 3	614	-62.2 (-77.4, -47.0)	0.44	151(143, 161)	164	107.9	-0.02(-0.10,0.06)
STATION 4	472	-15.3 (-27.0, -3.6)	0.49	96(90, 103)	97	70.7	-0.13(-0.22,-.04)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	460	-46.4 (-67.3, -25.6)	0.57	177(166, 189)	183	113.8	-0.16(-0.25,-.07)
2.5 TO 5.0	1234	-90.8 (-104.0, -77.7)	0.37	188(181, 196)	209	131.0	-0.04(-0.10,0.02)
> 5.0 M/SEC	348	-56.8 (-79.4, -34.1)	0.38	155(144, 168)	165	109.6	-0.01(-0.11,0.10)
B. STABILITY GROUP							
CLASS A & B	187	-67.0 (-91.8, -42.2)	0.41	170(154, 189)	182	131.7	-0.01(-0.16,0.13)
CLASS C	480	-102.5 (-126.4, -78.7)	0.29	212(199, 226)	235	145.9	0.00(-0.09,0.09)
CLASS D	1103	-85.2 (-100.0, -70.4)	0.38	181(173, 188)	200	128.6	-0.15(-0.21,-.09)
CLASS E & F	272	9.3 (-5.3, 23.9)	0.79	82(75, 89)	82	57.6	-0.40(-0.49,-.29)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1289	75.8	123.2	-47.4 (-58.8, -35.9)	0.35(0.32, 0.39)	-0.28(0.054)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	2333	63.0	108.1	-45.0 (-52.4, -37.7)	0.37(0.34, 0.40)	0.19(0.040)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	374	65.5	120.2	-54.7 (-75.5, -33.9)	0.34(0.28, 0.42)	0.23(0.099)
STATION 2	635	65.4	171.1	-105.7 (-123.1, -88.3)	0.27(0.23, 0.32)	0.33(0.076)
STATION 3	753	67.4	94.3	-27.0 (-38.4, -15.5)	0.62(0.54, 0.72)	-0.20(0.070)
STATION 4	571	53.0	48.0	4.9 (-2.4, 12.3)	0.92(0.78, 1.09)	-0.26(0.080)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	382	45.1	66.8	-21.7 (-40.0, -3.4)	0.10(0.08, 0.12)	-0.53(0.098)
2.5 TO 5.0	1287	57.6	119.2	-61.6 (-71.6, -51.6)	0.29(0.26, 0.32)	0.25(0.054)
> 5.0 M/SEC	664	83.8	110.2	-26.4 (-39.3, -13.4)	0.95(0.81, 1.11)	0.17(0.075)
B. STABILITY GROUP						
CLASS A & B	199	70.3	121.6	-51.3 (-75.0, -27.5)	0.83(0.62, 1.09)	0.32(0.136)
CLASS C	503	90.2	137.2	-47.1 (-64.8, -29.3)	0.64(0.54, 0.77)	0.22(0.086)
CLASS D	1207	56.2	123.8	-67.6 (-78.3, -56.9)	0.25(0.22, 0.28)	0.26(0.055)
CLASS E & F	424	46.8	22.2	24.6 (17.6, 31.5)	0.50(0.42, 0.61)	-0.70(0.093)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1289	-47.4 (-62.0, -32.8)	0.51	205(198, 213)	210	135.1	0.05(-0.01,0.10)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	2333	-45.0 (-55.2, -34.9)	0.48	183(178, 189)	189	122.9	-0.03(-0.07,0.01)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	374	-54.7 (-81.1, -28.3)	0.44	209(195, 225)	216	142.4	-0.04(-0.14,0.06)
STATION 2	635	-105.7 (-128.9, -82.6)	0.33	224(212, 237)	248	166.3	0.00(-0.08,0.07)
STATION 3	753	-27.0 (-43.0, -10.9)	0.52	165(157, 174)	167	115.1	-0.06(-0.13,0.01)
STATION 4	571	4.9 (-5.6, 15.5)	0.61	99(93, 105)	99	72.2	-0.20(-0.28,-.12)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	382	-21.7 (-42.6, -0.7)	0.66	184(172, 198)	185	100.9	-0.04(-0.14,0.06)
2.5 TO 5.0	1287	-61.6 (-75.6, -47.6)	0.45	191(184, 199)	201	132.9	-0.10(-0.16,-.05)
> 5.0 M/SEC	664	-26.4 (-41.8, -11.0)	0.43	163(155, 172)	165	116.3	0.08(0.00,0.15)
B. STABILITY GROUP							
CLASS A & B	199	-51.3 (-77.2, -25.4)	0.36	178(163, 198)	185	139.3	-0.10(-0.23,0.04)
CLASS C	503	-47.1 (-68.0, -26.2)	0.43	210(198, 224)	215	153.5	-0.07(-0.16,0.02)
CLASS D	1207	-67.6 (-82.0, -53.2)	0.40	192(184, 200)	203	128.5	-0.03(-0.09,0.02)
CLASS E & F	424	24.6 (15.6, 33.5)	0.80	82(77, 88)	86	63.3	-0.29(-0.37,-.20)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	357	25.7	49.7	-24.1 (-30.5, -17.7)	0.17(0.14, 0.21)	0.31(0.102)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	942	15.7	32.6	-16.9 (-20.0, -13.8)	0.17(0.15, 0.20)	0.25(0.063)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	187	18.0	29.7	-11.7 (-18.4, -5.0)	0.31(0.23, 0.41)	-0.25(0.141)
STATION 2	239	12.8	56.1	-43.3 (-51.3, -35.4)	0.07(0.05, 0.09)	0.48(0.124)
STATION 3	271	17.4	30.2	-12.7 (-17.6, -7.8)	0.20(0.16, 0.25)	-0.29(0.117)
STATION 4	245	14.8	14.4	0.4 (-2.9, 3.7)	1.18(0.92, 1.52)	-0.31(0.123)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	357	-24.1 (-31.9, -16.3)	0.42	58(54, 62)	62	41.2	0.18(0.08,0.28)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	942	-16.9 (-20.8, -13.0)	0.44	46(44, 48)	49	30.8	0.11(0.05,0.18)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	187	-11.7 (-18.1, -5.4)	0.49	43(39, 48)	45	29.9	0.16(0.02,0.30)
STATION 2	239	-43.3 (-52.5, -34.1)	0.23	60(55, 66)	74	51.3	0.15(0.02,0.27)
STATION 3	271	-12.7 (-18.2, -7.3)	0.46	38(35, 41)	40	26.6	0.21(0.09,0.32)
STATION 4	245	0.4 (-4.0, 4.7)	0.59	25(23, 27)	25	16.0	0.09(-0.04,0.21)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	346	34.1	52.5	-18.5 (-24.9, -12.1)	0.49(0.40, 0.60)	0.22(0.103)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	883	23.5	35.9	-12.3 (-15.6, -9.0)	0.47(0.42, 0.54)	0.19(0.065)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	166	20.4	33.9	-13.5 (-21.0, -6.1)	0.53(0.39, 0.72)	0.31(0.149)
STATION 2	217	25.8	62.7	-36.9 (-45.2, -28.6)	0.35(0.27, 0.46)	0.40(0.131)
STATION 3	263	27.5	33.9	-6.4 (-11.9, -0.8)	0.85(0.67, 1.08)	0.16(0.119)
STATION 4	237	19.3	14.9	4.4 (1.2, 7.6)	1.57(1.22, 2.03)	-0.24(0.125)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	346	-18.5 (-25.6, -11.3)	0.41	56(52, 60)	59	40.7	0.16(0.06,0.26)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	883	-12.3 (-16.3, -8.4)	0.45	47(45, 49)	48	32.1	0.13(0.07,0.20)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	166	-13.5 (-21.9, -5.2)	0.40	46(41, 51)	47	31.9	0.14(-0.01,0.29)
STATION 2	217	-36.9 (-45.7, -28.0)	0.27	59(54, 65)	69	49.5	0.11(-0.02,0.24)
STATION 3	263	-6.4 (-12.8, 0.0)	0.50	43(40, 47)	44	30.6	0.11(-0.01,0.23)
STATION 4	237	4.4 (0.7, 8.1)	0.61	25(23, 27)	25	18.0	0.06(-0.07,0.18)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	3043	70.8	36.9	33.8 (29.2, 38.5)	0.94(0.87, 1.00)	-0.66(0.035)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4308	62.8	41.7	21.1 (17.4, 24.8)	0.85(0.80, 0.90)	-0.53(0.029)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	888	78.6	33.2	45.4 (36.8, 54.1)	1.44(1.26, 1.64)	-0.67(0.065)
STATION 2	867	65.1	65.8	-0.7 (-10.3, 8.9)	0.59(0.51, 0.67)	-0.43(0.065)
STATION 3	1356	59.2	42.6	16.6 (9.8, 23.3)	0.64(0.58, 0.72)	-0.60(0.052)
STATION 4	1197	53.4	29.6	23.9 (18.7, 29.0)	1.39(1.24, 1.56)	-0.44(0.056)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	1158	57.2	27.3	29.9 (23.3, 36.5)	1.10(0.98, 1.24)	-0.74(0.057)
2.5 TO 5.0	2414	59.0	54.4	4.7 (-0.5, 9.8)	0.58(0.54, 0.63)	-0.43(0.039)
> 5.0 M/SEC	736	83.9	22.8	61.1 (53.3, 69.0)	3.98(3.45, 4.60)	-0.61(0.071)
B. STABILITY GROUP						
CLASS A & B	664	61.0	114.2	-53.2 (-65.4, -41.1)	0.78(0.67, 0.90)	0.33(0.075)
CLASS C	981	65.9	93.1	-27.2 (-37.1, -17.2)	0.63(0.56, 0.72)	0.17(0.061)
CLASS D	1848	69.8	6.6	63.2 (59.3, 67.1)	10.54(9.62,11.54)	-0.84(0.045)
CLASS E & F	815	44.6	0.4	44.2 (42.5, 45.9)	60.99(53.16,69.98)	-0.98(0.067)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	3043	33.8 (26.8, 40.8)	0.82	127(124, 131)	132	84.7	0.05(0.01,0.08)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4308	21.1 (15.3, 26.9)	0.74	127(124, 130)	129	84.7	-0.05(-0.08,-.02)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	888	45.4 (32.9, 58.0)	0.84	128(122, 134)	136	93.3	0.05(-0.02,0.12)
STATION 2	867	-0.7 (-16.2, 14.9)	0.66	152(145, 159)	152	102.4	-0.12(-0.18,-.05)
STATION 3	1356	16.6 (6.3, 26.9)	0.76	130(125, 135)	131	81.6	-0.05(-0.10,0.01)
STATION 4	1197	23.9 (15.5, 32.3)	0.72	97(94, 101)	100	69.2	-0.15(-0.21,-.10)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	1158	29.9 (20.6, 39.2)	0.84	117(113, 122)	121	75.5	-0.04(-0.10,0.01)
2.5 TO 5.0	2414	4.7 (-2.4, 11.7)	0.68	133(130, 137)	133	88.8	-0.05(-0.09,-.01)
> 5.0 M/SEC	736	61.1 (50.1, 72.2)	0.82	109(104, 115)	125	85.9	-0.02(-0.09,0.05)
B. STABILITY GROUP							
CLASS A & B	664	-53.2 (-69.4, -37.1)	0.36	164(156, 174)	173	124.4	-0.06(-0.13,0.02)
CLASS C	981	-27.2 (-40.7, -13.6)	0.46	167(160, 175)	169	116.0	-0.10(-0.16,-.04)
CLASS D	1848	63.2 (57.1, 69.3)	0.93	87(85, 90)	108	71.6	-0.08(-0.12,-.03)
CLASS E & F	815	44.2 (41.4, 47.0)	0.99	25(24, 26)	51	44.6	-0.11(-0.18,-.05)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2969	106.5	40.8	65.6 (59.3, 71.9)	2.32(2.16, 2.49)	-0.62(0.035)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4724	95.1	39.6	55.5 (51.0, 60.1)	2.21(2.08, 2.34)	-0.54(0.028)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	686	110.6	46.8	63.8 (49.7, 77.9)	2.36(2.03, 2.74)	-0.57(0.073)
STATION 2	1060	117.2	55.3	61.9 (50.5, 73.2)	1.89(1.67, 2.13)	-0.54(0.059)
STATION 3	1576	98.0	38.0	60.0 (51.9, 68.1)	2.26(2.04, 2.49)	-0.60(0.048)
STATION 4	1402	67.6	25.9	41.7 (36.7, 46.7)	2.76(2.49, 3.07)	-0.47(0.051)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	906	65.5	21.9	43.6 (36.8, 50.3)	0.93(0.82, 1.06)	-0.77(0.064)
2.5 TO 5.0	2470	86.9	51.3	35.6 (29.0, 42.1)	1.56(1.45, 1.69)	-0.47(0.039)
> 5.0 M/SEC	1348	130.1	30.0	100.1 (91.1, 109.1)	6.77(6.08, 7.53)	-0.57(0.052)
B. STABILITY GROUP						
CLASS A & B	598	85.3	121.1	-35.8 (-52.0, -19.5)	1.52(1.29, 1.78)	0.30(0.079)
CLASS C	1112	114.1	88.5	25.6 (13.6, 37.6)	1.84(1.64, 2.07)	-0.12(0.058)
CLASS D	1999	103.7	7.9	95.8 (90.2, 101.5)	33.96(31.11,37.07)	-0.80(0.043)
CLASS E & F	1015	63.2	0.4	62.7 (59.4, 66.1)	165.9(146.6,187.6)	-0.98(0.060)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	2969	65.6 (55.5, 75.7)	0.81	173(168, 177)	185	117.7	0.03(0.00,0.07)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	4724	55.5 (48.2, 62.8)	0.78	162(159, 166)	171	111.5	-0.04(-0.07,-.02)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	686	63.8 (39.7, 87.9)	0.77	190(180, 200)	200	132.0	-0.02(-0.09,0.06)
STATION 2	1060	61.9 (43.5, 80.2)	0.77	196(188, 205)	205	140.2	-0.09(-0.15,-.03)
STATION 3	1576	60.0 (47.0, 73.0)	0.80	168(163, 174)	178	114.3	-0.05(-0.10,0.00)
STATION 4	1402	41.7 (33.8, 49.6)	0.76	100(97, 104)	109	76.5	-0.11(-0.16,-.06)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	906	43.6 (34.6, 52.5)	0.88	112(108, 118)	121	83.0	-0.17(-0.24,-.11)
2.5 TO 5.0	2470	35.6 (26.4, 44.8)	0.72	170(165, 175)	174	111.4	-0.05(-0.09,-.01)
> 5.0 M/SEC	1348	100.1 (86.2, 114.0)	0.82	167(161, 174)	195	130.7	0.03(-0.03,0.08)
B. STABILITY GROUP							
CLASS A & B	598	-35.8 (-59.3, -12.2)	0.36	210(199, 223)	213	155.2	-0.08(-0.16,0.00)
CLASS C	1112	25.6 (9.8, 41.4)	0.55	214(206, 224)	216	145.3	-0.10(-0.16,-.04)
CLASS D	1999	95.8 (87.0, 104.7)	0.92	132(128, 136)	163	104.0	-0.08(-0.13,-.04)
CLASS E & F	1015	62.7 (57.6, 67.9)	0.99	55(53, 57)	83	63.2	-0.08(-0.14,-.02)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1011	63.4	32.9	30.5 (24.6, 36.4)	1.46(1.29, 1.65)	-0.55(0.060)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1536	53.6	36.7	16.9 (12.5, 21.4)	1.29(1.16, 1.42)	-0.38(0.049)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	326	67.0	29.1	37.9 (27.3, 48.4)	2.82(2.27, 3.50)	-0.52(0.107)
STATION 2	343	51.1	53.9	-2.7 (-13.3, 7.8)	0.84(0.68, 1.04)	-0.23(0.104)
STATION 3	484	51.2	37.9	13.3 (5.3, 21.2)	0.89(0.75, 1.07)	-0.45(0.087)
STATION 4	383	47.5	26.2	21.4 (14.5, 28.3)	2.26(1.85, 2.76)	-0.32(0.098)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	376	51.1	25.1	26.0 (16.8, 35.2)	1.92(1.57, 2.35)	-0.59(0.099)
2.5 TO 5.0	934	48.9	44.1	4.8 (-0.9, 10.4)	0.86(0.75, 0.98)	-0.30(0.063)
> 5.0 M/SEC	226	77.3	25.2	52.1 (40.5, 63.7)	4.33(3.33, 5.63)	-0.49(0.128)
B. STABILITY GROUP						
CLASS A & B	232	48.3	83.0	-34.7 (-49.1, -20.2)	1.17(0.90, 1.52)	0.40(0.126)
CLASS C	441	53.8	65.6	-11.8 (-21.5, -2.1)	1.35(1.12, 1.62)	0.23(0.092)
CLASS D	641	59.3	12.5	46.8 (41.4, 52.1)	5.00(4.28, 5.84)	-0.67(0.076)
CLASS E & F	222	42.4	0.5	41.8 (38.9, 44.7)	11.19(8.59,14.57)	-0.99(0.129)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	CHARACTERISTIC DISCREPANCIES: ROOT MEAN SQUARE ERROR (UG/M**3)	CHARACTERISTIC DISCREPANCIES: AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1011	30.5 (23.3, 37.7)	0.76	90(86, 94)	95	67.3	0.12(0.06,0.18)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1536	16.9 (11.0, 22.9)	0.66	91(88, 94)	92	65.7	-0.02(-0.07,0.03)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	326	37.9 (25.1, 50.6)	0.75	92(85, 99)	99	75.1	0.12(0.01,0.22)
STATION 2	343	-2.7 (-16.4, 10.9)	0.54	103(96, 111)	103	72.5	-0.07(-0.17,0.04)
STATION 3	484	13.3 (3.0, 23.6)	0.68	90(85, 96)	91	63.4	-0.03(-0.12,0.06)
STATION 4	383	21.4 (11.1, 31.7)	0.66	73(68, 78)	76	54.5	-0.13(-0.23,-.03)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	376	26.0 (14.4, 37.6)	0.73	94(88, 102)	98	65.0	-0.09(-0.19,0.01)
2.5 TO 5.0	934	4.8 (-2.2, 11.7)	0.60	87(84, 92)	88	64.3	0.01(-0.06,0.07)
> 5.0 M/SEC	226	52.1 (37.3, 66.9)	0.78	86(79, 95)	101	72.5	0.07(-0.06,0.20)
B. STABILITY GROUP							
CLASS A & B	232	-34.7 (-49.3, -20.0)	0.31	108(99, 119)	113	83.0	0.07(-0.06,0.20)
CLASS C	441	-11.8 (-22.4, -1.2)	0.40	105(99, 113)	106	74.1	-0.03(-0.13,0.06)
CLASS D	641	46.8 (39.6, 53.9)	0.84	71(68, 75)	85	61.6	-0.11(-0.18,-.03)
CLASS E & F	222	41.8 (38.4, 45.3)	1.00	23(21, 25)	48	42.7	-0.14(-0.27,-.01)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1077	89.1	33.9	55.2 (47.7, 62.7)	3.81(3.39, 4.30)	-0.50(0.059)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1828	78.6	32.5	46.1 (40.9, 51.3)	3.71(3.38, 4.06)	-0.41(0.045)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	276	86.8	37.7	49.0 (33.8, 64.3)	3.47(2.74, 4.40)	-0.46(0.116)
STATION 2	441	91.4	43.3	48.1 (35.9, 60.3)	3.37(2.80, 4.07)	-0.38(0.092)
STATION 3	602	82.6	31.8	50.8 (41.3, 60.3)	3.98(3.39, 4.68)	-0.47(0.078)
STATION 4	509	58.4	21.1	37.3 (31.2, 43.4)	4.93(4.14, 5.86)	-0.41(0.085)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)						
A. WIND SPEED						
< 2.5 M/SEC	314	53.4	13.4	40.0 (32.8, 47.3)	2.61(2.09, 3.25)	-0.75(0.109)
2.5 TO 5.0	1013	71.4	41.6	29.8 (23.0, 36.6)	2.40(2.12, 2.72)	-0.32(0.060)
> 5.0 M/SEC	501	109.0	26.1	82.9 (71.3, 94.5)	10.84(9.09,12.91)	-0.49(0.086)
B. STABILITY GROUP						
CLASS A & B	230	61.3	80.8	-19.5 (-35.6, -3.3)	3.34(2.58, 4.33)	0.46(0.127)
CLASS C	469	96.2	63.7	32.5 (19.6, 45.5)	4.41(3.68, 5.29)	-0.15(0.039)
CLASS D	778	83.7	14.0	69.7 (62.7, 76.7)	8.98(7.80,10.34)	-0.68(0.069)
CLASS E & F	351	55.3	0.3	55.1 (50.7, 59.4)	388.8(315.2,479.6)	-1.00(0.103)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	1077	55.2 (45.6, 64.8)	0.78	121(116, 126)	133	89.9	0.11(0.05,0.17)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	1828	46.1 (39.2, 53.0)	0.73	113(109, 117)	122	84.3	0.01(-0.04,0.05)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	276	49.0 (27.1, 71.0)	0.70	129(119, 141)	138	97.5	0.00(-0.12,0.11)
STATION 2	441	48.1 (31.8, 64.3)	0.71	130(122, 140)	139	98.8	0.00(-0.09,0.10)
STATION 3	602	50.8 (38.4, 63.3)	0.76	119(113, 126)	129	88.3	-0.01(-0.09,0.07)
STATION 4	509	37.3 (29.6, 45.0)	0.74	72(68, 77)	81	59.7	-0.08(-0.17,0.01)
4. BY METEOROLOGICAL CONDITION, ALL STATIONS (B-4)							
A. WIND SPEED							
< 2.5 M/SEC	314	40.0 (30.8, 49.2)	0.84	74(68, 80)	84	62.9	-0.29(-0.39,-.18)
2.5 TO 5.0	1013	29.8 (21.3, 38.3)	0.66	111(106, 116)	115	81.4	0.00(-0.06,0.06)
> 5.0 M/SEC	501	82.9 (67.9, 97.9)	0.81	128(121, 137)	152	103.5	0.12(0.03,0.20)
B. STABILITY GROUP							
CLASS A & B	230	-19.5 (-36.5, -2.4)	0.28	124(114, 137)	125	92.9	0.01(-0.12,0.14)
CLASS C	469	32.5 (18.3, 46.8)	0.54	143(135, 153)	147	102.1	0.00(-0.10,0.09)
CLASS D	778	69.7 (61.0, 78.3)	0.87	101(97, 107)	123	84.1	-0.07(-0.14,0.00)
CLASS E & F	351	55.1 (50.2, 59.9)	1.00	42(39, 45)	69	55.1	-0.06(-0.17,0.04)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	351	26.1	11.7	14.3 (11.3, 17.4)	1.95(1.58, 2.40)	-0.49(0.103)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	814	17.8	9.3	8.6 (6.9, 10.2)	1.71(1.49, 1.97)	-0.43(0.067)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	165	20.1	7.5	12.6 (8.6, 16.6)	3.67(2.70, 4.99)	-0.47(0.150)
STATION 2	179	16.6	13.4	3.2 (-0.4, 6.8)	0.83(0.61, 1.11)	-0.32(0.144)
STATION 3	245	19.0	9.7	9.3 (6.4, 12.3)	1.04(0.81, 1.34)	-0.56(0.123)
STATION 4	225	15.9	6.9	9.0 (6.2, 11.9)	4.57(3.51, 5.94)	-0.42(0.128)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED SO_2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS					CORRELATION COEFFICIENT
		BIAS		CHARACTERISTIC DISCREPANCIES			
		AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	351	14.3 (10.6, 18.1)	0.82	26(24, 28)	30	20.5	0.20(0.10,0.30)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	814	8.6 (6.6, 10.6)	0.74	22(21, 23)	24	16.3	0.14(0.07,0.21)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	165	12.6 (8.0, 17.3)	0.77	25(22, 28)	28	19.2	0.15(0.00,0.30)
STATION 2	179	3.2 (-0.5, 6.9)	0.62	22(20, 25)	23	16.6	0.15(0.00,0.29)
STATION 3	245	9.3 (6.0, 12.7)	0.79	21(20, 23)	23	16.6	0.18(0.06,0.30)
STATION 4	225	9.0 (4.7, 13.3)	0.76	21(19, 23)	22	13.5	0.13(0.00,0.25)

TABLE B. (PART 1) COMPARISON OF OBSERVED AND PREDICTED SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	PERFORMANCE MEASURES - UNPAIRED COMPARISONS: DIFFERENCE OF AVERAGES (Co - Cp) (UG/M**3)	VARIANCE COMPARISON (So**2/Sp**2)	FREQUENCY DISTRIBUTION COMPARISON (F(Co) - F(Cp)) MAX (FRACTION)
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	336	35.0	12.7	22.3 (18.2, 26.4)	5.08(4.10, 6.30)	-0.41(0.105)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	801	25.7	9.6	16.1 (13.9, 18.3)	5.33(4.64, 6.12)	-0.37(0.068)
3. ALL CONCENTRATIONS, BY STATION (B-1)						
STATION 1	139	23.9	9.6	14.3 (8.7, 20.0)	3.90(2.79, 5.45)	-0.44(0.163)
STATION 2	187	29.7	12.8	16.8 (11.7, 22.0)	4.87(3.65, 6.50)	-0.30(0.141)
STATION 3	245	29.4	10.2	19.2 (14.9, 23.4)	6.06(4.71, 7.79)	-0.44(0.123)
STATION 4	230	19.8	6.4	13.3 (10.6, 16.0)	10.25(7.91,13.29)	-0.37(0.127)

TABLE B. (PART 2) COMPARISON OF OBSERVED AND PREDICTED
SO2 CONCENTRATION VALUES EVENT-BY-EVENT (PAIRED IN TIME)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

DATA SETS	NUMBER OF EVENTS	PERFORMANCE MEASURES - PAIRED COMPARISONS: BIAS: AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	BIAS: FRACTION OF POSITIVE RESIDUALS (Co > Cp)	CHARACTERISTIC DISCREPANCIES: NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1. HIGHEST CONCENTRATION, EVENT-BY-EVENT (A-1)	336	22.3 (17.9, 26.6)	0.83	34(32, 37)	41	27.7	0.28(0.18,0.37)
2. ALL CONCENTRATIONS, ALL STATIONS (PAIRED IN TIME AND LOCATION) (B-3)	801	16.1 (13.8, 18.4)	0.76	29(27, 30)	33	21.9	0.24(0.17,0.30)
3. ALL CONCENTRATIONS, BY STATION (B-1)							
STATION 1	139	14.3 (7.6, 21.1)	0.71	30(27, 34)	33	22.5	0.24(0.08,0.39)
STATION 2	187	16.8 (11.3, 22.4)	0.72	34(31, 38)	38	25.7	0.13(-0.01,0.27)
STATION 3	245	19.2 (14.8, 23.5)	0.79	31(28, 34)	36	24.5	0.25(0.13,0.37)
STATION 4	230	13.3 (10.6, 16.0)	0.80	19(17, 21)	23	15.8	0.32(0.20,0.43)

APPENDIX C

Statistics for Highest Concentration at Each Station

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
740.9	1182.8	-441.8 (-1314, 431)	0.25	548 (311,2045)	649	527.3	-0.94(-1.00,0.18)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
690.4	1019.5	-329.1 (-879, 221)	0.25	346 (196,1289)	445	374.6	-0.31(-0.98,0.93)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1050.8	1503.0	-452.2 (-1090, 186)	0.00	401 (227,1495)	570	452.2	0.55(-0.87,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
866.3	1172.5	-306.2 (-780, 168)	0.00	298 (169,1111)	400	306.2	0.75(-0.76,0.99)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
531.8	668.5	-136.7 (-465, 192)	0.25	207 (117, 771)	225	200.3	0.61(-0.85,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
414.4	436.7	-22.3 (-287, 243)	0.50	166 (94, 621)	146	129.2	-0.29(-0.98,0.93)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
687.8	604.2	83.6 (-319, 486)	0.50	253 (143, 943)	234	183.6	0.19(-0.94,0.97)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
593.7	490.8	102.9 (-44, 250)	0.75	92 (52, 344)	130	106.6	0.78(-0.73,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
129.1	125.2	3.9 (-135, 142)	0.50	87 (49, 325)	75	65.8	-0.76 (-0.99,0.74)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPTER AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
104.0	102.9	1.1 (-88, 90)	0.50	56 (32, 209)	49	46.8	-0.90 (-1.00,0.44)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
171.7	113.2	58.4 (1, 116)	1.00	36 (20, 135)	66	58.4	0.61 (-0.85,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPTER AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
146.1	93.6	52.5 (23, 82)	1.00	18 (10, 69)	55	52.5	0.81 (-0.68,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
740.9	1038.8	-297.8 (-908, 312)	0.25	383 (217,1429)	446	343.8	-0.96(-1.00,0.07)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
690.4	917.0	-226.6 (-604, 151)	0.25	237 (134, 884)	306	245.6	-0.33(-0.98,0.92)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1050.8	1713.3	-662.4 (-1332, 7)	0.00	421 (238,1568)	756	662.4	0.96(-0.04,1.00)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
866.3	1457.3	-590.9 (-1233, 51)	0.00	404 (229,1505)	687	590.9	0.71(-0.79,0.99)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
531.8	626.3	-94.5 (-413, 224)	0.50	200 (113, 746)	197	165.8	0.51(-0.89,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
414.4	425.3	-10.8 (-186, 164)	0.50	110 (62, 409)	96	92.3	-0.41(-0.98,0.91)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
687.8	807.0	-119.2 (-801, 563)	0.50	429 (243,1598)	390	267.4	0.53(-0.88,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
593.7	523.8	69.9 (-142, 282)	0.75	133 (75, 496)	135	121.8	0.71(-0.79,0.99)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
129.1	111.4	17.7 (-114, 150)	0.50	83 (47, 309)	74	59.9	-0.79 (-1.00,0.71)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: MPSDM AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
104.0	96.9	7.2 (-75, 90)	0.50	52 (29, 193)	45	41.4	-0.99 (-1.00,-.56)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
171.7	118.7	53.0 (-35, 141)	0.75	55 (31, 205)	71	62.1	0.39 (-0.91,0.98)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: MPSDM AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
146.1	87.6	58.5 (37, 80)	1.00	13 (8, 50)	60	58.5	0.91 (-0.41,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
740.9	2200.0	-1459.1 (-2934, 15)	0.00	927 (525,3455)	1665	1459.1	-0.83(-1.00,0.65)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
690.4	1811.3	-1120.8 (-2191, -50)	0.00	673 (381,2508)	1263	1120.8	-0.32(-0.98,0.93)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1050.8	2760.3	-1709.4 (-3581, 162)	0.00	1176 (666,4385)	1990	1709.4	0.39(-0.91,0.98)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
866.3	2316.5	-1450.2 (-2754, -146)	0.00	819 (464,3055)	1614	1450.2	0.80(-0.70,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
531.8	1047.1	-515.2 (-1297, 266)	0.25	491 (278,1832)	668	545.1	-0.16(-0.97,0.95)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
414.4	936.3	-521.9 (-1214, 170)	0.00	435 (246,1621)	644	521.9	-0.07(-0.97,0.96)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
687.8	1140.9	-453.1 (-1404, 497)	0.50	597 (338,2227)	688	475.6	0.57(-0.87,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
593.7	778.3	-184.6 (-520, 151)	0.25	211 (119, 786)	260	197.5	0.94(-0.21,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
129.1	208.2	-79.1 (-296, 138)	0.25	136 (77, 508)	142	134.6	-0.92 (-1.00,0.36)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: PPSP AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
104.0	187.7	-83.7 (-257, 90)	0.25	109 (62, 407)	126	113.2	-0.81 (-1.00,0.69)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
171.7	214.9	-43.2 (-184, 98)	0.50	89 (50, 331)	88	76.7	0.55 (-0.87,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: PPSP AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
146.1	169.5	-23.4 (-113, 66)	0.25	56 (32, 209)	54	35.3	0.84 (-0.63,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
740.9	829.8	-88.8 (-559, 381)	0.25	295 (167,1101)	271	246.3	-0.68(-0.99,0.81)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
690.4	704.8	-14.3 (-361, 332)	0.50	218 (123, 812)	189	182.2	0.08(-0.95,0.97)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
1050.8	890.8	160.1 (-254, 575)	0.75	260 (148, 971)	277	227.1	0.52(-0.88,0.99)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 1 HOUR

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
866.3	814.3	52.1 (-217, 322)	0.75	169 (96, 632)	156	143.1	0.78(-0.72,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
531.8	408.4	123.4 (-86, 333)	0.75	131 (74, 490)	168	146.2	0.32(-0.93,0.98)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
414.4	335.8	78.6 (-167, 324)	0.75	154 (87, 575)	155	131.9	-0.83(-1.00,0.65)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
687.8	316.2	371.6 (196, 547)	1.00	110 (63, 412)	384	371.6	0.84(-0.63,1.00)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 3 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
593.7	288.7	305.0 (207, 403)	1.00	62 (35, 229)	310	305.0	0.89(-0.50,1.00)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
129.1	77.1	52.0 (-64, 169)	1.00	73 (41, 273)	82	52.0	-0.83 (-1.00,0.65)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1975) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
104.0	69.9	34.1 (-39, 108)	0.50	46 (26, 172)	53	37.7	-0.96 (-1.00,-.02)

TABLE C

COMPARISON OF MAXIMUM OBSERVED AND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
171.7	61.0	110.6 (69, 153)	1.00	26 (15, 98)	113	110.6	0.91 (-0.39,1.00)

COMPARISON OF SECOND MAXIMUM OBSERVED AND SECOND MAXIMUM
PREDICTED CONCENTRATION VALUES, PAIRED BY STATION (A - 2)

MUSKINGUM (1976) MODEL: TEM-8A AVERAGING TIME: 24 HOURS

		PERFORMANCE MEASURES					
		BIAS		CHARACTERISTIC DISCREPANCIES			
AVERAGE OBSERVED VALUE (Co) (UG/M**3)	AVERAGE PREDICTED VALUE (Cp) (UG/M**3)	AVERAGE DIFFERENCE (Co - Cp) (UG/M**3)	FRACTION OF POSITIVE RESIDUALS (Co > Cp)	NOISE (SD) (UG/M**3)	ROOT MEAN SQUARE ERROR (UG/M**3)	AVERAGE ABSOLUTE DIFFERENCE (UG/M**3)	CORRELATION COEFFICIENT
146.1	53.5	92.6 (74, 111)	1.00	12 (7, 44)	93	92.6	0.93 (-0.27,1.00)

APPENDIX D

Comparisons of Highest Values for Various Pairings

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:MPTER AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	804.0 (4, 23,17)	1783.0 (2,286,11)	-979.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	804.0 (4, 23,17)	61.0 (4, 23,17)	743.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	804.0 (4, 23,17)	61.0 (4, 23,17)	743.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	804.0 (4, 23,17)	633.0 (4,323,15)	171.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	0.0 (2,286,11)	1783.0 (2,286,11)	-1783.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	0.0 (1,286,11)	1783.0 (2,286,11)	-1783.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	626.0 (2,276,16)	1783.0 (2,286,11)	-1157.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:MPTER AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	1191.3 (1,256,12)	1963.0 (1,180,10)	-771.8
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	1191.3 (1,256,12)	1963.0 (1,180,10)	-771.8
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	0.0 (1,180,10)	1963.0 (1,180,10)	-1963.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	3.3 (2,180,10)	1963.0 (1,180,10)	-1959.7
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	1191.3 (1,256,12)	1963.0 (1,180,10)	-771.8

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:MPTER AVERAGING TIME: 3 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	606.3 (3,332, 5)	963.3 (3,323, 5)	-357.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	606.3 (3,332, 5)	0.0 (3,332, 5)	606.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	606.3 (3,332, 5)	0.0 (1,332, 5)	606.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	606.3 (3,332, 5)	963.3 (3,323, 5)	-357.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	15.0 (3,323, 5)	963.3 (3,323, 5)	-948.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	46.3 (2,323, 5)	963.3 (3,323, 5)	-917.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	606.3 (3,332, 5)	963.3 (3,323, 5)	-357.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:MPTER AVERAGING TIME: 3 HOURS

SO_2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	852.0 (3, 55, 5)	878.3 (2,203, 4)	-26.3
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	852.0 (3, 55, 5)	0.0 (3, 55, 5)	852.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	852.0 (3, 55, 5)	0.0 (1, 55, 5)	852.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	852.0 (3, 55, 5)	428.3 (3,240, 6)	423.7
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	20.0 (2,203, 4)	878.3 (2,203, 4)	-858.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	20.0 (2,203, 4)	878.3 (2,203, 4)	-858.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	715.0 (2,267, 5)	878.3 (2,203, 4)	-163.3

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:MPTER AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	206.0 (4, 28)	165.8 (2,140)	40.1
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	206.0 (4, 28)	2.5 (4, 28)	203.4
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	206.0 (4, 28)	2.5 (4, 28)	203.4
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	206.0 (4, 28)	86.4 (4, 29)	119.6
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	56.3 (2,140)	165.8 (2,140)	-109.6
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	70.8 (3,140)	165.8 (2,140)	-95.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	89.4 (2,276)	165.8 (2,140)	-76.5

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:MPTER AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	218.0 (3, 55)	137.5 (1,223)	80.6
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	218.0 (3, 55)	9.8 (3, 55)	208.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	218.0 (3, 55)	39.0 (4, 55)	179.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	218.0 (3, 55)	113.6 (3,225)	104.4
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	94.1 (1,223)	137.5 (1,223)	-43.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	94.1 (1,223)	137.5 (1,223)	-43.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	172.4 (1, 68)	137.5 (1,223)	34.9

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:MPSDM AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	804.0 (4, 23,17)	1452.0 (2, 28,18)	-648.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	804.0 (4, 23,17)	30.0 (4, 23,17)	774.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	804.0 (4, 23,17)	30.0 (4, 23,17)	774.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	804.0 (4, 23,17)	712.0 (4,170, 8)	92.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	0.0 (2, 28,18)	1452.0 (2, 28,18)	-1452.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	217.0 (4, 28,18)	1452.0 (2, 28,18)	-1235.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	626.0 (2,276,16)	1452.0 (2, 28,18)	-826.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:MPSDM AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	1191.3 (1,256,12)	2362.0 (1,109, 8)	-1170.8
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	1191.3 (1,256,12)	2362.0 (1,109, 8)	-1170.8
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	0.0 (1,109, 8)	2362.0 (1,109, 8)	-2362.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	109.7 (3,109, 8)	2362.0 (1,109, 8)	-2252.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	1191.3 (1,256,12)	2362.0 (1,109, 8)	-1170.8

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:MPSDM AVERAGING TIME: 3 HOURS

SO_2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	606.3 (3,332, 5)	876.3 (3,323, 5)	-270.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	606.3 (3,332, 5)	0.0 (3,332, 5)	606.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	606.3 (3,332, 5)	38.0 (2,332, 5)	568.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	606.3 (3,332, 5)	876.3 (3,323, 5)	-270.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	15.0 (3,323, 5)	876.3 (3,323, 5)	-861.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	46.3 (2,323, 5)	876.3 (3,323, 5)	-830.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	606.3 (3,332, 5)	876.3 (3,323, 5)	-270.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:MPSDM AVERAGING TIME: 3 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	852.0 (3, 55, 5)	1508.3 (1,109, 3)	-656.3
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	852.0 (3, 55, 5)	0.0 (3, 55, 5)	852.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	852.0 (3, 55, 5)	0.0 (1, 55, 5)	852.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	852.0 (3, 55, 5)	630.0 (3,209, 4)	222.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	5.2 (1,109, 3)	1508.3 (1,109, 3)	-1503.1
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	78.1 (3,109, 3)	1508.3 (1,109, 3)	-1430.2
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	765.2 (1,114, 5)	1508.3 (1,109, 3)	-743.1

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:MPSDM AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	206.0 (4, 28)	150.0 (3,140)	56.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	206.0 (4, 28)	2.0 (4, 28)	204.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	206.0 (4, 28)	93.5 (2, 28)	112.4
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	206.0 (4, 28)	72.6 (4,140)	133.3
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	70.8 (3,140)	150.0 (3,140)	-79.1
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	70.8 (3,140)	150.0 (3,140)	-79.1
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	106.1 (3,332)	150.0 (3,140)	-43.9

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:MPSDM AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	218.0 (3, 55)	190.7 (1,109)	27.4
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	218.0 (3, 55)	5.1 (3, 55)	212.9
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	218.0 (3, 55)	16.9 (4, 55)	201.2
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	218.0 (3, 55)	103.4 (3,225)	114.7
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	78.8 (1,109)	190.7 (1,109)	-111.9
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	78.8 (1,109)	190.7 (1,109)	-111.9
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	172.4 (1, 68)	190.7 (1,109)	-18.3

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:PPSP AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp.	804.0 (4, 23,17)	3033.0 (2,321,13)	-2229.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	804.0 (4, 23,17)	278.0 (4, 23,17)	526.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	804.0 (4, 23,17)	1106.0 (2, 23,17)	-302.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	804.0 (4, 23,17)	1140.0 (4, 16, 8)	-336.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	81.0 (2,321,13)	3033.0 (2,321,13)	-2952.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	81.0 (2,321,13)	3033.0 (2,321,13)	-2952.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	626.0 (2,276,16)	3033.0 (2,321,13)	-2407.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:PPSP AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	1191.3 (1,256,12)	4068.0 (2,273, 9)	-2876.8
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	1191.3 (1,256,12)	3295.0 (1,273,16)	-2103.8
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	39.0 (2,273, 9)	4068.0 (2,273, 9)	-4029.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	39.0 (2,273, 9)	4068.0 (2,273, 9)	-4029.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	976.0 (2,267,13)	4068.0 (2,273, 9)	-3092.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:PPSP AVERAGING TIME: 3 HOURS

SO_2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	606.3 (3,332, 5)	1536.3 (2,321, 5)	-930.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	606.3 (3,332, 5)	3.0 (3,332, 5)	603.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	606.3 (3,332, 5)	14.0 (2,332, 5)	592.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	606.3 (3,332, 5)	909.0 (3,321, 5)	-302.7
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	107.0 (2,321, 5)	1536.3 (2,321, 5)	-1429.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	184.3 (4,321, 5)	1536.3 (2,321, 5)	-1352.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	489.1 (2,276, 5)	1536.3 (2,321, 5)	-1047.3

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:PPSP AVERAGING TIME: 3 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	852.0 (3, 55, 5)	1981.7 (1,273, 6)	-1129.7
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	852.0 (3, 55, 5)	11.0 (3, 55, 5)	841.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	852.0 (3, 55, 5)	40.0 (2, 55, 5)	812.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	852.0 (3, 55, 5)	825.3 (3,273, 3)	26.7
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	357.2 (1,273, 6)	1981.7 (1,273, 6)	-1624.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	357.2 (1,273, 6)	1981.7 (1,273, 6)	-1624.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	765.2 (1,114, 5)	1981.7 (1,273, 6)	-1216.4

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:PPSP AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	206.0 (4, 28)	298.1 (2,114)	-92.2
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	206.0 (4, 28)	18.4 (4, 28)	187.5
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	206.0 (4, 28)	101.2 (2, 28)	104.8
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	206.0 (4, 28)	95.0 (4,114)	111.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	2.5 (2,114)	298.1 (2,114)	-295.7
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	17.8 (3,114)	298.1 (2,114)	-280.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	89.4 (2,276)	298.1 (2,114)	-208.8

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:PPSP AVERAGING TIME: 24 HOURS

SO_2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	218.0 (3, 55)	299.3 (2,177)	-81.3
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	218.0 (3, 55)	60.4 (3, 55)	157.7
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	218.0 (3, 55)	73.0 (2, 55)	145.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	218.0 (3, 55)	179.8 (3,177)	38.3
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	37.8 (2,177)	299.3 (2,177)	-261.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	37.8 (2,177)	299.3 (2,177)	-261.4
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	185.8 (2,267)	299.3 (2,177)	-113.5

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:TEM-8A AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	804.0 (4, 23,17)	1019.0 (2, 7,10)	-215.0
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	804.0 (4, 23,17)	17.0 (4, 23,17)	787.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	804.0 (4, 23,17)	17.0 (4, 23,17)	787.0
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	804.0 (4, 23,17)	489.0 (4,321,11)	315.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	0.0 (2, 7,10)	1019.0 (2, 7,10)	-1019.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	128.0 (3, 7,10)	1019.0 (2, 7,10)	-891.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	626.0 (2,276,16)	1019.0 (2, 7,10)	-393.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:TEM-8A AVERAGING TIME: 1 HOUR

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,HOUR)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	1191.3 (1,256,12)	1136.0 (3,362,10)	55.3
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	1191.3 (1,256,12)	0.0 (1,256,12)	1191.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	1191.3 (1,256,12)	836.0 (1,242, 9)	355.3
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	10.0 (3,362,10)	1136.0 (3,362,10)	-1126.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	42.0 (2,362,10)	1136.0 (3,362,10)	-1094.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	1153.0 (3, 28,12)	1136.0 (3,362,10)	17.0

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:TEM-8A AVERAGING TIME: 3 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	606.3 (3,332, 5)	534.7 (2,286, 4)	71.7
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	606.3 (3,332, 5)	0.0 (3,332, 5)	606.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	606.3 (3,332, 5)	0.0 (1,332, 5)	606.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	606.3 (3,332, 5)	521.3 (3,286, 4)	85.0
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	79.0 (2,286, 4)	534.7 (2,286, 4)	-455.7
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	79.0 (2,286, 4)	534.7 (2,286, 4)	-455.7
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	489.1 (2,276, 5)	534.7 (2,286, 4)	-45.6

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:TEM-8A AVERAGING TIME: 3 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY,TIME PERIOD)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	852.0 (3, 55, 5)	411.3 (2, 35, 5)	440.7
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	852.0 (3, 55, 5)	0.3 (3, 55, 5)	851.7
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	852.0 (3, 55, 5)	0.7 (4, 55, 5)	851.3
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	852.0 (3, 55, 5)	404.3 (3, 35, 5)	447.7
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	0.0 (2, 35, 5)	411.3 (2, 35, 5)	-411.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	2.7 (1, 35, 5)	411.3 (2, 35, 5)	-408.7
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	715.0 (2,267, 5)	411.3 (2, 35, 5)	303.7

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1975) MODEL:TEM-8A AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	206.0 (4, 28)	103.5 (3,141)	102.4
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	206.0 (4, 28)	0.0 (4, 28)	205.9
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	206.0 (4, 28)	0.0 (4, 28)	205.9
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	206.0 (4, 28)	48.6 (4,323)	157.4
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	7.3 (3,141)	103.5 (3,141)	-96.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	7.3 (3,141)	103.5 (3,141)	-96.3
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	106.1 (3,332)	103.5 (3,141)	2.5

TABLE D. COMPARISONS OF HIGHEST OBSERVED AND PREDICTED CONCENTRATION VALUES FOR DIFFERENT TIME AND SPACE PAIRINGS (A - 3)

MUSKINGUM (1976) MODEL:TEM-8A AVERAGING TIME: 24 HOURS

SO2 CONCENTRATIONS (UG/M**3)
(STATION,DAY)

	OBSERVED	PREDICTED	DIFFERENCE
MAX Co AND MAX Cp	218.0 (3, 55)	72.7 (2,225)	145.3
MAX Co AND PREDICTED VALUE FOR SAME EVENT AND LOCATION AS MAX Co	218.0 (3, 55)	7.4 (3, 55)	210.7
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME EVENT AS MAX Co (ANY LOCATION)	218.0 (3, 55)	11.5 (4, 55)	206.6
MAX Co AND HIGHEST PREDICTED VALUE FOR SAME LOCATION AS MAX Co (ANY EVENT)	218.0 (3, 55)	72.5 (3,225)	145.5
MAX Cp AND OBSERVED VALUE FOR SAME EVENT AND LOCATION AS MAX Cp	45.8 (2,225)	72.7 (2,225)	-27.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME EVENT AS MAX Cp (ANY LOCATION)	45.8 (2,225)	72.7 (2,225)	-27.0
MAX Cp AND HIGHEST OBSERVED VALUE FOR SAME LOCATION AS MAX Cp (ANY EVENT)	185.8 (2,267)	72.7 (2,225)	113.1